SURFACE ENVIRONMENT & MINING

SEAM

USDA FOREST SERVICE PROGRAM

USER GUIDE to SOCIOLOGY AND ECONOMICS

Mining and Reclamation in the West

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USER GUIDE TO SOCIOLOGY AND ECONOMICS

MINING AND RECLAMATION IN THE WEST

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Forest Service
U.S. Department of Agriculture
Ogden, Utah 84401

RESEARCH SUMMARY

The sociologist and economist working on a forest where mining developments are occurring either in or near it must be aware of the potential impacts of mining on the economy and cultures surrounding the forest, and hence, on the management of that forest. This guide covers major points of concern to the sociologist and economist involved in mitigating the adverse effects of such minerals developments, including: land-management planning, issue identification and resolution, sociologic and economic tools for land managers, and role statements for the economist and sociologist in the context of minerals developments.

Information includes supporting graphic material, notes on additional sources of information, a glossary, and an index.

ACKNOWLEDGMENTS

The contents of this guide are based on presentations and discussions during the Surface Environment & Mining (SEAM) sponsored Sociology and Economics Workshop, May 8-9, 1979, Winter Park, Colorado. Credit is due all attendees and presenters for their input. Those who attended are listed in appendix B. In addition, major contributors are listed under chapter titles as appropriate.

A special note of thanks is extended to Gary H. Elsner, Lyle Gomm, Terry G. Solberg, and Ed Thor, members of the cadre which planned the workshop. The workshop program coordinator was Edwin R. Browning (SEAM) and the technical adviser was Fred Wagstaff (SEAM).

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INTRODUCTION

MINERAL AND NONMINERAL RESOURCES

An adequate, reliable supply of minerals is essential to the economy and security of the United States, since minerals provide the physical basis for almost all activities of U.S. citizens. While imports can satisfy an important part of the country's minerals demand, they make the U.S. vulnerable to the economic and political decisions of foreign countries. Thus, the mineral deposits within the U.S. are a most important source of this nation's supply.

A substantial portion of the domestic minerals supply presently comes from lands managed by the Federal Government. Federal lands contain a majority of the metallic minerals, as well as major resources of coal, oil shale, geothermal steam, uranium, and oil and gas. These same Federal lands, however, also contain valuable nonmineral resources, including timber, forage, water, wildlife, scenic landforms, and wilderness. The Government's holdings of such resources are now among the most significant in the world.

While it is clearly in the national interest to provide for the identification and production of the mineral resources on Federal land, it is also necessary to provide for a sustained high-level output of the various renewable resources on that land. Thus, the demand for mineral development must be balanced against the demand for renewable resources and the land-management agency's responsibility to reasonably protect the environment and communities affected by mineral-related operations.

MINERALS IN THE LAND-MANAGEMENT PLANNING PROCESS

The Forest Service, as one of the agencies responsible for Federal land management, has a relatively sophisticated planning program for the management of nonmineral resources on land under its jurisdiction. Historically, however, the Forest Service's land-management and planning systems have treated minerals as a distinct category outside of the mainstream of the land-management planning process. There are two basic reasons for this separation:

1. The mining and mineral leasing laws have tended to make mineral activity the preferred use on any Federal land open to such activity. The thinking has been that on lands open to mineral activity, mineral development will generally override the designated primary nonmineral uses.

2. Planning for use of the mineral and nonmineral resources is complicated considerably by the difficulties of identifying and estimating the value of mineral resources. Mineral resources can be found only through costly and risky exploration. Therefore, land-management planning has tended to concentrate, at least until a mineral discovery is made, on the surface resource potential of the land.

The long-standing premise that mineral activity is always the most valuable use of a tract of land is increasingly being challenged. Many mineral deposits being discovered today are of lower grade, located at greater depths, and are therefore more expensive to find and mine than the high grade deposits formerly developed. Another significant factor is that nonmineral surface resources are now also considered to be scarce, and their value has increased accordingly.

Hence, when all the mineral and nonmineral values are weighed for a particular proposal at a specific location, the value of the mineral resources may be outweighed by the value of the nonmineral resources. The process of weighing values usually occurs in an Environmental Assessment required by the National Environmental Policy Act of 1969 (NEPA) (P. L. 91-190), and is basic to determining the proper mix of uses for any given land area.

Given this situation of mineral and non-

mineral values on the same tract of Federal land, decisions as to the proper use of a particular tract of land will always involve balancing the values of mineral and nonmineral resources. If this balancing is to be done in a reasonable manner, adequate information on and analysis of all values are needed.

BACKGROUND: THE FORMATION AND MISSION OF SEAM

Realizing the complexity of such decisions, in 1973, the Forest Service chartered the Surface Environment and Mining program (SEAM) to coordinate research, development, and application related to land and people impacts resulting from minerals exploration and development in the West. From 1973 to 1979, SEAM sponsored more than 150 research and development projects. Together, the projects have greatly added to the body of knowledge surrounding the management of land in mineralized areas. (For purposes of this discussion, mineralized areas are defined as those areas that have some potential for mining.)

To get this knowledge to the specialists in the field in a form they could readily use, SEAM brought together researchers and users from industry, Federal agencies, and the academic community to share their practical knowledge and study results in a series of workshops. The information presented at these workshops is organized into five user guides. Each guide focuses on a specific discipline involved in resource management related to mineral activities and is written for specialists in these disciplines. The guides will also be of use to land managers, land planners, and other specialists, since many activities related to minerals-area management demand that a variety of skills be applied to achieve an integrated approach.

In addition to the User Guide to Sociology and Economics, guides have been written for vegetation, soils, hydrology, and engineering. Cross-referencing among these guides is provided in the index. A handbook for minerals specialists has also been written. A handbook for land managers will provide a general overview of administrative considerations surrounding mineral commodities commonly explored for and developed on national forest lands administered by the Forest Service. Concurrent with the development of the SEAM user guides, a USDA handbook on visual management related to mining and reclamation, entitled "Mining," is in press as volume 2 of the National Forest Landscape Management Series. A guide for the wildlife specialty is also planned. All guides will be updated periodically to keep them current with research findings.

The purpose of the guides is to help specialists more clearly understand their role in mineral exploration and development activities by outlining some of the major concepts they can use to insure that such activities integrate with land-management plans; that impacts are mitigated to a reasonable degree; and that reclamation meets state-of-the-art performance and cost/benefit standards. Perhaps by using these guides as a common starting point, those involved in minerals management can more easily work together toward achieving these common goals: (1) appropriate consideration of mineral values in land-management planning; (2) protection of surface resources during mining activities; (3) reclamation of surface-mined land to a productive use; and (4) mitigation of the adverse social/economic effects resulting from minerals development.

SOCIOLOGY AND ECONOMICS IN MINERALS ACTIVITIES

Of course, the Forest Service emphasizes that the integration of *all* resource uses is vital to the proper management of NFS lands—and here the skills of the sociologist and economist can be used to advantage. But perhaps nowhere more than in the case of minerals developments can social and economic skills aid the land manager. Beyond the obvious task of placing dollar values on mineral deposits located on NFS lands, the concerns and demands of the people living in the vicinity of a large-scale mining development must be considered by the area's public-land managers. The sociologist and economist can play a crucial role in these situations as they work to:

- Provide an approach to predicting society/forest management interrelationships;
- Integrate this model into forest planning and decisionmaking;

• Give the approach meaning to district rangers and other on-the-ground personnel for day-to-day practical use.

This guide will discuss some of the concepts that can be used to achieve these goals.

HOW TO USE THIS GUIDE

The roles of the Forest Service sociologist and economist are illustrated in table 1, "Stages of Mineral Exploration and Development Activities," and table 2, "Roles of Forest Service Specialists in Minerals Activities," which follow this introduction. As you will note, the Forest Service economist and sociologist can provide expertise in predicting social and economic effects resulting from mining when the operating plan is submitted—long before mining gets underway. Then, during mining and reclamation stages, they will monitor and record any changes so that adjustments in the management plan can be made, if necessary, to respond to these changes. In this way, the effects of the development will be managed in a proactive, rather than reactive mode. In other words, rather than reacting to crises, the sociologist and economist will be part of the forest's interdisciplinary (ID) team from the time land-management planning begins. Then, if and when mineral activities occur, the team will have foreseen potential problems and will have determined general objectives in advance.

The first chapter of this book will look at the role of the ID team both in land-management planning and in site-specific operational planning for mineral activities on National Forest System lands. The importance of the ID team in integrating both mineral and nonmineral values for the decisionmaker cannot be overemphasized. The interdisciplinary approach to planning is uniquely suited to giving the best available assessment of the spectrum of opportunities and problems of managing surface and human resources that may be affected by mineral-related operations and the requirements needed for reasonable protection of nonmineral resources. Soils, vegetation, hydrology, topography, geology, wildlife, climate, and social and economic information are some of the factors that must be considered by the ID team. Such land management and planning must always proceed on the basis of existing information. In the case of mineral resources, this will almost always be difficult because the mineral resources are hidden beneath the surface and information is provided in increments as exploration proceeds. And, of course, human values and concerns are always difficult to interpret. One of the principal goals of Federal land management, therefore, should be to improve such management by obtaining better mineral resource information and integrating it into the decisionmaking process.

When using this guide, the reader should keep in mind that, for the most part, the information is concerned with concepts. While specific costs and physical and legal constraints are a crucial part of the planning process, discussion of these aspects is limited here.

One final note: Social and economic skills are as much an art as a science. To clarify specific points or to keep up with new developments, readers are urged to contact the workshop participants who contributed to this guide.

Additional Information:

For more information on the mining process, refer to "Anatomy of a Mine," USDA For. Serv. Gen. Tech. Rep. INT-35, 1977. Intermt. For. and Range Exp. Stn., Ogden, Utah.

Table 1. — *Stages of mineral exploration and development activities*[1]

Prospecting	Exploration	Feasibility studies/operating plan
A. Administrative Action No administrative action required; however, some evidence of mineralization or a hunch	A. Administrative Action Permit/Lease Notice of intent from miner (for certain commodities, may also serve as operating plan if there is minimal surface disturbance) Exploration license EA may be necessary See Handbook for Land Managers (in press) for variation within commodities	A. Administrative Action Submission of necessary permits (EA, EIS, etc.) and operating plan—see Handbook for Land Managers (in press) for variation within commodities
B. Activities Literature search Geological inference Evaluation of existing data Research on rights to land/minerals	B. Activities More intensive literature search Access road construction On-site testing and evaluation of data—geological, geochemical, geophysical, drilling, sampling, shaft sinking Seismic activity Acquiring land/mineral rights Rehabilitation of exploration impacts Environmental and socioeconomic studies	B. Activities Feasibility studies Grade and size of deposit Cost of mining and rehabilitation Market Fiscal Technical studies—mine design Environmental and socioeconomic studies (if not done during exploration) Decision to proceed with development Preparation of operating plan including rehabilitation program and end use Ordering of equipment
C. Environmental Impacts Minimal, if any	C. Environmental Impacts Roads Drill holes Drill pads Dozer holes Exploration camps	C. Environmental Impacts Generally none at this stage
D. Tasks for the Economist Economic base study: Monitor factors which affect supply and demand for minerals Make forecasts of supply and demand Predict probability	D. Tasks for the Economist Economic impacts: Analyze costs and benefits of alternative exploration methods Participate with the sociologist in identification of existing and emerging issues	D. Tasks for the Economist Economic analyses: Provide expertise in environmental analysis process: issue identification decision criteria cost/benefit analysis of alternatives tradeoff and opportunity cost evaluations Analyze effects of development on: demand for surface resources human behavioral patterns community economics
E. Tasks for the Sociologist Sociological base study: Identify the basic social/cultural descriptors of the affected communities Note current trends	E. Tasks for the Sociologist Social impact analysis and planning: Assist in structuring public involvement plan for appropriate: issue identification issue analysis mitigation action Identify critical trigger points from a social perspective	E. Tasks for the Sociologist Social impact analysis: Provide expertise in environmental analysis process: decision criteria issue identification Analyze effects of development on the cultural and political community Consider effects of alternative plans on social well being

[1] The various phases have considerable overlap. The material provided for each phase is illustrative, not complete, and considerable variation is found by commodity. The existence of a forest plan is assumed. Tasks (D and E) are primarily input from a land-management agency's economist or sociologist. For purposes of discussion, the terms reclamation and rehabilitation are used interchangeably, and mining includes oil and gas activities.

Development[2]	Mining/reclamation	Postmining
A. Administrative Action Approval of necessary operating plan	A. Administrative Action No administrative action required. Mining overlaps with development and reclamation overlaps with mining; reclamation of previously mined areas occurs concurrently with new mining as stipulated in operating plan Any changes in operating plan	A. Administrative Action Release of reclamation bond
B. Activities Securing of financing More extensive testing and definition of the mineral Construction of transportation routes and utilities Construction of mine and processing plant (facilities, water supply, etc.) Construction of waste deposits Continued evaluation of data Change mining plan if necessary	B. Activities Extraction of mineral Processing of mineral Depositing wastes Operation of transportation systems Rehabilitation Monitoring for any changes in biological and physical environment Amend mining and rehabilitation plan if necessary	B. Activities Surface owner manages land after bond release Monitoring for any changes in biological and physical environment Management and maintenance for end-use objective
C. Environmental Impacts Mine Processing plant Waste dumps Transportation and access routes Utilities Increased population resulting from construction	C. Environmental Impacts Impacts directly related to operational aspects of mining; impacts are strongly affected by commodity mined and type of operation	C. Environmental Impacts Directly related to management and maintenance activities
D. Tasks for the Economist Monitoring: Record costs Monitor economic changes	D. Tasks for the Economist Monitoring: Record costs Monitor economic changes	D. Tasks for the Economist Analysis of results and development of new model: Monitor to determine accuracy of predictions for future use
E. Tasks for the Sociologist Monitoring: Record changes Identify areas of individual or group stress relating to mineral activity and make recommendations to mitigate effects	E. Tasks for the Sociologist Monitoring: Record changes	E. Tasks for the Sociologist Monitoring: Analyze results and develop new model and base study Monitor and record critical changes to establish new baseline situation

[2] Development is herein defined as the phase which begins after the right to mine has been established.

Table 2.—*Roles of Forest Service specialists in minerals activities*

	Prospecting	Exploration	Feasibility studies/operating plan
Vegetation specialist	None at this point	Review of plans to reclaim land impacted by exploration Review and assist in vegetation aspects of environmental studies	Review adequacy of operating plan for: Reclamation program — species selection plant materials site preparation planting methods cultural treatments Monitoring/retreatment program for vegetation Vegetation aspects of end use
Soils scientist	None at this point	Review of plans to reclaim land impacted by exploration Review and assist in soils aspects of environmental studies Review soils inventory progress in the the mineralized areas; if needed, recommend timely completion or upgrading	Review adequacy of operating plan for: Reclamation Program— soils surveys storage area selection materials handling plans spoils analysis plan spoils treatments spoils surfacing and erosion control Monitoring/retreatment program for soils Soils aspects of end use
Hydrologist	Establish baseline water-quality monitoring as needed according to plan	Review of plans to reclaim land impacted by exploration Review and assist in hydrologic aspects of environmental studies	Review adequacy of operating plan for: Hydrologic considerations— surface water subsurface water snow management roads impoundments mine drainage Hydrologic aspects of end use
Engineer	None at this point	Review of plans to reclaim land impacted by exploration Review and assist in engineering aspects of environmental studies	Review adequacy of operating plan for: Engineering considerations— air pollution transportation facilities surface-mine facilities mine-waste disposal embankments tailings dams and impoundments subsidence Engineering aspects of end use
Economist	Monitor factors which affect supply and demand for minerals Make forecasts of supply and demand Predict probability	Analyze costs and benefits of alternative exploration methods Participate with the sociologist in identification of existing and emerging issues	Provide expertise in environmental analysis process: issue identification decision criteria cost/benefit analysis of alternatives tradeoff and opportunity-cost evaluations Analyze effects of development on: demand for surface resources human behavioral patterns community economics
Sociologist	Identify the basic social/cultural descriptors of the affected communities Note current trends	Assist in structuring public involvement plan for appropriate: issue identification issue analysis mitigation action Identify critical trigger points from a social perspective	Provide expertise in environmental analysis process: decision criteria issue identification Analyze effects of development on the cultural and political community Consider effects of alternative plans on social well-being

Development	Mining/reclamation	Postmining
Monitor vegetation impacts and activities for conformance to operating plan. Advise on plan revisions when necessary	Monitor vegetation impacts and activities for conformance to operating plan. Advise on plan revisions when necessary Advise from a vegetation standpoint on release of reclamation bond	Monitor any continued impacts on vegetation Manage vegetation for end-use objective
Monitor impacts on soils Monitor soils-related activites for conformance to operating plan. Advise on plan revisions when necessary	Monitor soils impacts and activities for conformance to operating plan. Advise on plan revisions when necessary Advise from a soils standpoint on release of reclamation bond	Monitor any continued impacts on soils Manage soils for end-use objective
Monitor impacts on hydrology	Monitor impacts on hydrology and hydrologic aspects of rehabilitation program Have hydrologic input into release of reclamation bond	Monitor any continued impacts on hydrology Manage hydrology for end-use objective
Monitor engineering-related activities for conformance to operating plan Advise on plan revisions when necessary	Advise from an engineering standpoint on release of reclamation bond	Monitor any continued impacts from engineered structures Manage structures for end-use objective
Record costs Monitor economic changes	Record costs Monitor economic changes	Mointor to determine accuracy of predictions for future use
Monitor Record changes Identify areas of individual or group stress relating to mineral activity and make recommendations to mitigate effects	Monitor Record changes	Monitor and record critical changes to establish new baseline situation

Chapter 1
LAND-MANAGEMENT PLANNING

Major Contributors: Neal Jensen, W. David Zimmerman, Deen Lundeen

The enactment of the National Forest Management Act (NFMA) of 1976[1] has sharpened the focus on the planning and management of National Forest System (NFS) lands. As directed by the NFMA, greater emphasis must now be placed on public participation in the development, review, and revision of land and resource management plans. Coordination of such plans with State and local units of government and other Federal agencies is required. In addition, national, regional, and local resource goals will be assessed periodically based on supply and demand of renewable resources from public and private forest and rangelands. And, the NFMA requires an interdisciplinary (ID) team approach within the Forest Service in planning for and managing NFS resources.

For the Forest Service sociologist and economist, these new regulations have particular significance. In addition to the likelihood that these scientists will, at some point, be requested by the land manager to participate in the ID team, the skills of the sociologist and economist are particularly relevant to several of the planning actions outlined by the NFMA regulations.

For example, directions for planning and management require that:

1. Planning be driven by and respond to issues.

2. The best available resource data and information be collected, including the views of citizens, special interest groups, and other Federal, State, and local agencies.

3. The synthesis and evaluation of such data and information be carried out utilizing professional and administrative judgments as how to best meet the statutory goals and objectives and achieve the interests and expectations of the public. The economist and sociologist, with their skills in the human behavioral sciences, will be important contributors to this new process.

In particular, the NFMA regulations state that economic analysis of management program alternatives to determine economic consequences be undertaken, and that this economic analysis be done at all appropriate places throughout the planning process. And, NFMA states that the public must be adequately informed throughout the planning process and that procedures for public participation must be documented.

To familiarize the social scientist with the new framework in which he will play a role, this chapter will discuss the planning process as outlined by the NFMA regulations; the interdisciplinary team; and the new operational mode that has evolved out of these changes. To illustrate the role the sociologist and economist could play in these areas, examples of how their skills might be used are provided in several places. A more detailed discussion of their roles, especially when a mineral development is having an impact on the forest or surrounding community, will follow later in this guide.

THE PLANNING PROCESS

The NFMA regulations spell out 10 planning actions that must be followed during the planning process, with the note that these activities are a general framework, and additional steps may have to be added to link these elements together. The first four planning actions are a continuous process—they take place all the time and not in any particular order. The last six ac-

[1] U.S. Laws, Statutes, etc. Public Law 94-588. [S. 1075], Oct. 22, 1976. National Forest Management Act of 1976. In United States code congressional and administrative news. 94th Congr. 2d sess., 1976 Vol. 2, p. 2949-2963. West Publ. Co., St. Paul, Minn. [1976.]

tions are sequential activities that take place whenever a change or amendment to the plan is needed. The planning actions are listed in figure 1. An explanation of each action follows:

• **Planning Action 1—Identification of issues, management concerns, and opportunities.**

To plan and manage effectively, the land manager must know what he is to manage for. This direction will come from an evaluation of public issues, management concerns, and resource use and development opportunities.

As defined in the NFMA regulations, a public issue is a subject or question of widespread public interest relating to management of National Forest System lands and identified through pub-

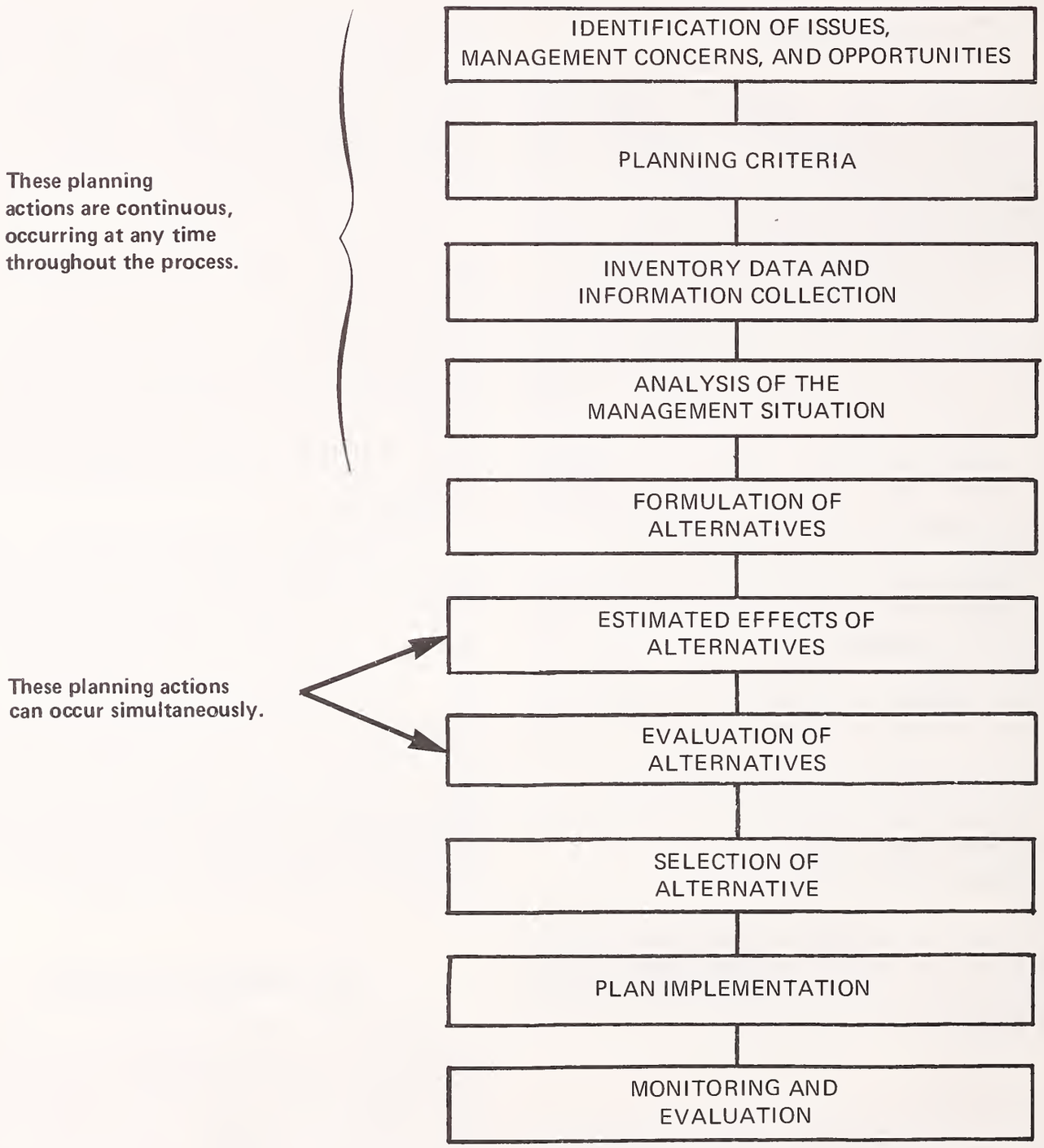


Figure 1. Ten planning actions in the planning process.

lic participation. A management concern is an issue or problem requiring resolution, or condition constraining management practices, identified by the interdisciplinary team.

This first planning action in the process is a continuous activity; Forest Service personnel will continually monitor emerging issues, concerns, and opportunities, their importance, how they can be resolved, and what responsibility or authority the Forest Service has for resolving them.

Public participation and coordination with other Federal agencies, States, and local governments throughout the planning process will be essential in identifying, evaluating, and resolving public issues. In other words, issues become the driver of the planning process.

The sociologist, with skills in understanding the interactions of human groups, can be a primary identifier and analyst of public issues. The economist, with skills in understanding how economic factors influence the way people relate to their surroundings, can help analyze the source of issues and detect emerging issues.

(Issue identification and resolution will be covered in more detail in chapter 2.)

• **Planning Action 2—Planning criteria.**

Two types of planning criteria are involved in this step:

1. **Decision criteria.** From an evaluation of issues, concerns, and program requirements from the regional or national level, the planning team will develop a set of goals and objectives that will resolve the issues, concerns, and requirements. These goals and objectives become the criteria that the planning process will try to meet; objectives will also provide guidance for evaluation and selection of alternatives later on in the process.

2. **Process criteria.** This information provides a framework for going through the planning process. Process criteria can include data and information requirements, analysis requirements, and the feasibility of management practices.

The sociologist can aid in determining whether these decision criteria will satisfy public concerns. The economist can aid in establishing goals and objectives which are useful decision criteria and can evaluate the objectives from an economic standpoint: costs and benefits involved, budgeting required, etc.

• **Planning Action 3—Inventory data and information collection.**

Collection of current, up-to-date information comes at this point in the planning process because data should only be gathered to answer questions raised by the issues and concerns and to satisfy the goals set in the planning criteria. Existing information will be used whenever possible. This is in contrast to the traditional practice of collecting data first and then trying to interpret what has been collected. Under the new planning process, the ID team will identify what data are needed, and then it becomes the responsibility of the staff specialists to gather these data and bring them back to the team. The information and data collection system used must also be consistent with monitoring and evaluation procedures so that these two steps tie together.

The sociologist and economist will supply and interpret sociological and economic data in consultation with the ID team.

• **Planning Action 4—Analysis of the management situation.**

All of the preceding planning actions—which are continuing types of activities—are brought together at this point. The issues and concerns are summarized and directed toward this action, data are synthesized into information, and the information and concerns are analyzed. The primary purpose of this step is to assess the ability of the area under planning to supply goods and services in response to society's demand for those goods and services. The analysis will display the capability and suitability of the forest to supply outputs and uses, and will project demands for the outputs or uses over time. It will identify any special conditions or situations which involve hazards to the resources in the planning area and their relationship to proposed and possible actions being considered.

Specifically this analysis will determine:

- Ranges of various goods, services, and uses that are feasible under existing conditions at various levels of management intensity.
- Projections of demand, using the best available techniques, with both price and nonprice information. These projections, in conjunction with supply/cost information, will be used to evaluate the level of goods and services that maximizes public benefits. To the extent possi-

ble, demand will be assessed as a price/quantity relationship.

- Potential to resolve public issues and management concerns.
- Technical and economic feasibility of providing the levels of goods, services, and uses resulting from assigned goals and objectives.
- The need, as a result of this analysis, to establish or change management direction.

The overall final objective of this analysis is to determine whether or not the existing plan is adequate or whether changes are needed. If the existing plan is adequate, the land manager can continue to follow it, keeping in motion the first four actions of the planning process. If the plan is not adequate, the next six planning actions should be followed sequentially.

The economist can apply his skills to the economic analyses required in this step. For example, he can determine the relationship between resource outputs and services. The sociologist can aid in determining if present management is resolving public issues and management concerns.

- **Planning Action 5—Formulation of alternatives.**

A reasonable range of practical alternatives will be formulated by the ID team. Alternatives will be described in draft and final Environmental Impact Statements. The purpose of the management practices proposed will be clearly stated for each alternative.

Alternatives will display a range of possible outputs of resources. Beginning with a present situation, or a no-action type of alternative, the team will develop various types of alternatives that will address the major issues and concerns identified earlier in the planning process, and will also meet national or regional program requirements. Each alternative must be capable of being achieved and must state the conditions and uses that will result, the goods and services to be produced, and the timing and flow of those goods and services. Each alternative must also specify the resource management standards and guidelines that will be put into effect with that alternative.

The economist and sociologist can help structure the alternatives to meet social/economic decision criteria and can identify the social and economic concerns addressed by each alternative.

- **Planning Action 6—Estimated effects of alternatives.**

The ID team will estimate and display the physical, geological, economic, and social effects of implementing each alternative. These will include the following:

- Expected outputs, both for market and nonmarket types of goods or resources.
- The relationship between the local, short-term uses and long-term productivity.
- Adverse environmental effects that cannot be avoided.
- Resource commitments that are irreversible.
- Direct and indirect benefits and costs. This will require determining expected administrative costs, real dollar value of outputs, real dollar investments and operating costs, which alternatives come nearest to maximizing the net public benefits, and the economic effects of the alternatives. The effects of the alternatives on minority groups, prime farmlands, wetlands, and flood plains must also be considered.

The sociologist and economist can estimate the social and economic effects of implementing each alternative.

- **Planning Action 7—Evaluation of alternatives.**

At this point, the decision criteria developed in planning action 2 come back into play. The land manager will decide which one of the alternatives best meets those criteria. As part of these criteria, the alternatives must be compared by: economic efficiency, distributional aspects, outputs of goods and services, and protection and enhancement of environmental resources. This analysis is used to determine whether or not a preferred alternative can be identified, and if so, to select the alternative that will be used in the draft Environmental Impact Statement.

Again, the sociologist and economist can evaluate differences in the social and economic aspects of the alternatives.

- **Planning Action 8—Selection of alternative.**

After publication of the draft Environmental Impact Statement (EIS), the ID team will evaluate public comments and, as necessary, revise the appropriate alternative. The responsible of-

ficial will recommend a selected alternative for the final EIS, using the decision criteria that have been developed, and will document the benefits of choosing this alternative.

The sociologist can aid in evaluating public comments. The economist can apply his skills to comparing economic aspects of the decision criteria to the selected alternative.

• Planning Action 9—Plan implementation.

During the implementation of each plan, the responsible official will assure that annual program proposals and implemented projects are in compliance with the plan. He will also make sure that program budget allocations meet the objectives and are consistent with all applicable standards and guidelines specified in the plan.

The economist can play a significant role in program budget proposals.

• Planning Action 10—Monitoring and evaluation.

At intervals established in the plan, management practices will be evaluated on a sample basis to determine how well objectives have been met and how closely management standards and guidelines have been applied. The results of monitoring and evaluation will be used to analyze the management situation and make revisions in the plan as necessary.

The sociologist and the economist can be primary identifiers of the need for revisions in the plan to respond to changing social and/or economic conditions.

Additional Information:

Much of the information in this chapter was based on the Federal Register, Vol. 44, No. 181, Monday, September 17, 1979, "National Forest System Land and Resources Management Planning (as corrected in the Federal Register of September 19, 1979)," USDA Forest Service (36 CFR Part 219).

A computer tool has been developed to aid the ID team in planning program allocations. Called ADVENT, this computer program can tie multiyear projects developed for different management option levels of funding to the goals and objectives of the Resources Planning Act. Targets are produced based on outputs and activities within dollar and manpower constraints. For more information on ADVENT, contact Management Sciences Staff, Pacific Southwest For. and Range Exp. Stn., Berkeley, Calif.

THE INTERDISCIPLINARY TEAM

A key element in the new planning approach is the interdisciplinary (ID) team. The development of the ID team is a direct result of the NFMA and the National Environmental Policy Act (NEPA)[2] of 1969. Both Acts require specialists to work as a team in developing the forest plan. This is in contrast to using a functional or multidisciplinary approach in which the separate specialists gather information and then bring it to the land manager or planner, who integrates the various points of view.

Specifically, the NFMA regulations state that the ID team will represent two or more areas of specialized technical knowledge about natural resource management applicable to the area under planning, and that the team will be involved in a continuous planning process. It also directs the team to consider problems collectively rather than to separate them along disciplinary lines. The regulations, however, do not state what types of disciplines should be represented on this team. Instead, the line officer responsible for the planning process will choose the team, based on the types of resources and issues that must be considered.

Some members of the team will be permanent. This nucleus will coordinate and lead the planning process. But the team will also recruit members on an interim basis to address specific issues. Their length of stay on the team could vary from a few hours to several months. Thus, theoretically, every specialist in the organization is a potential ID team member, with a core group of people making overall decisions on who

[2]U.S. Laws, Statutes, etc. Public Law 91-190. [S. 1075], Jan. 1, 1970. National Environmental Policy Act of 1969. An act to establish a national policy for the environment, to provide for the establishment of a Council on Environmental Quality, and for other purposes. In its United States statutes at large. 1969. Vol. 83, p. 852-856. U.S. Gov. Print. Off., Washington, D.C. 1970. [42 U.S.C. 4321, 433-4335, 4341-4347.]

should be brought in to resolve certain issues and concerns.

Obviously, such an approach makes the planning job much more complex. Individuals representing various disciplines will have to cooperate with other specialists, as the team works in a combined effort toward meeting the objectives of the group's decision criteria. Thus, team building efforts may be needed to help the group learn how to work more effectively together.

One way to look at how the ID team will fit into the overall national forest management system is represented in figure 2. As shown in the chart, the forest system is divided into three parts as follows:

1. **The management team.** The management team is the decisionmaking body. The line officer and other members of his primary staff, such as district rangers on the forest level, or the regional forester and his primary staff at a regional level, are part of this team.

2. **The interdisciplinary planning team.** This team is responsible for all the planning within an administrative unit. The ID team's role can be broken down into two main categories: planning operations, and planning information and analysis. Planning operations can be considered the core team that keeps all planning activities on track. The six responsibilities under planning operations include:

- ID team leadership.
- Planning system support. This can include informal information systems, which could be anything from a file cabinet to an elaborate computer data retrieval bank, and analytical systems, which again can range from simple manual mathematical procedures to a complex computer model.
- Coordination, both internal within the agency, and external.
- Legal assistance.
- Document preparation. Preparation of the plans, the environmental statements, budget proposals, planning process documentation, etc.
- Administrative support. Personnel, fiscal, and operations support.

The second role of the ID team includes planning and analysis of the physical, biological, social and economic, and management systems. In other words, the planning operations part of the ID team leads and coordinates the team, while the planning information and analysis part of the team provides the studies that are needed to develop the forest plan.

3. **Ongoing program management.** This third part of the forest system is responsible for implementing the plans. It is the operational part of the system and takes care of all programs and projects, including administration, monitoring, and enforcement.

NEW OPERATIONAL MODE

The sum of the NFMA regulations points to a new mode of operation for Forest Service specialists, whether they are planners, sociologists, economists, or hydrologists. The following discussion contrasts the new mode with the historic mode of operation in the Forest Service, with the qualification that the old mode may have many valuable aspects and the new mode may have weaknesses. In other words, the contrast is not meant to set one mode up as categorically superior to the other, but simply to show the new direction of NFS planning and management in the years ahead—a direction that will affect all Forest Service personnel.

1. From multidisciplinary to interdisciplinary. Rather than each specialist concerning himself only with his discipline, the new mode of operation calls for members of the ID team to integrate their disciplines into the planning process.

2. From a data-oriented approach to an issue-oriented approach. Rather than specialists collecting data to add to the knowledge surrounding their discipline, data collection is now directed by the issues and concerns being addressed.

3. From an emphasis on strictly gathering facts to an emphasis on evaluation and the predictive capability of the specialist. In other words, what does the specialist know and what can he infer and predict from this knowledge that will aid in formulating alternative management directions?

4. From planning as a report to planning as a process. In the new mode of operation, planning will be an ongoing, continuous process and will be part of the management approach, not simply

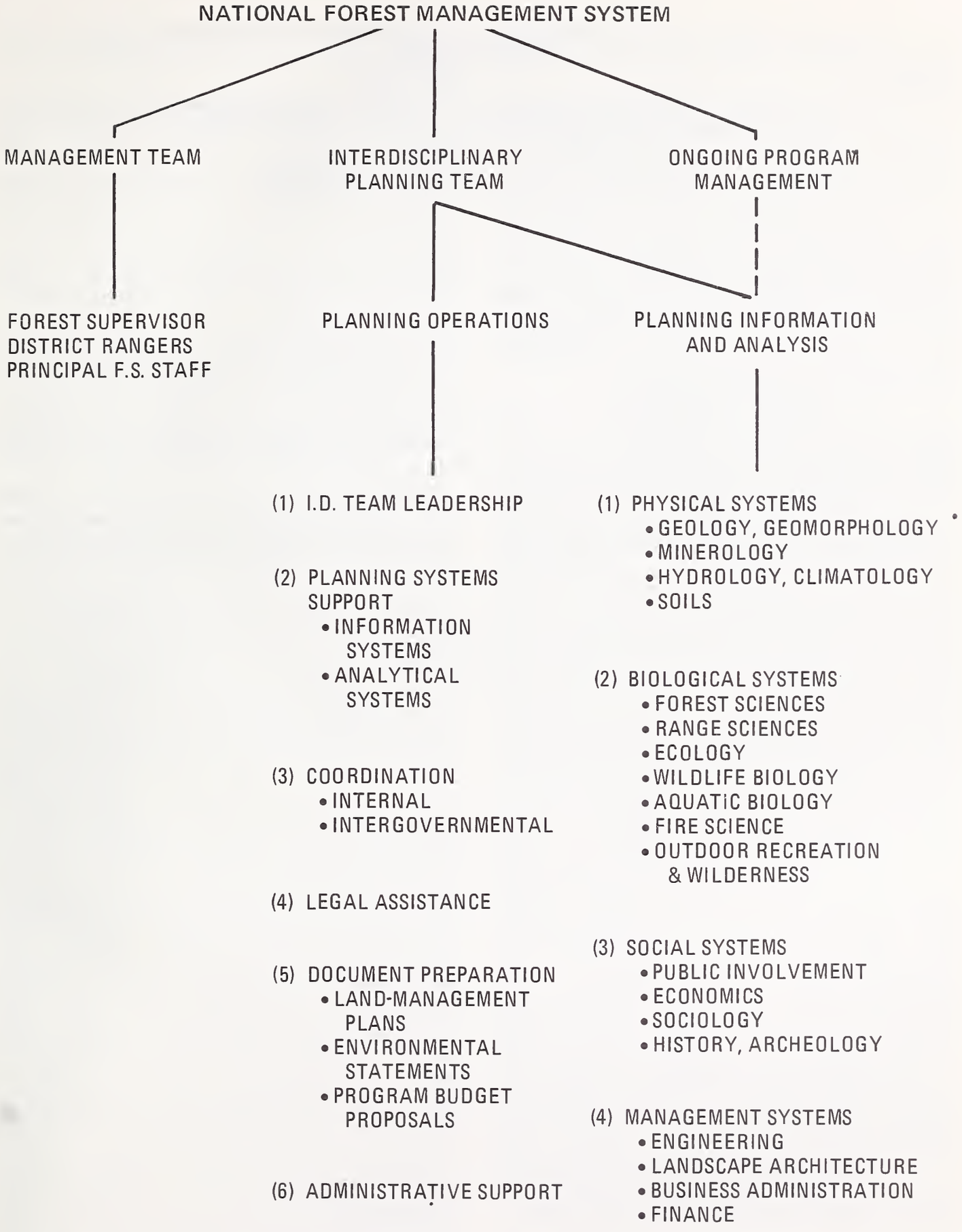


Figure 2. The interdisciplinary team in relation to the national forest management system.

a document. The ID team leader will facilitate and manage the planning process for the manager.

5. From a concept of public involvement that focuses on explaining plans to the public to a concept of public involvement as a continuing process in developing plans.

6. From an approach where disagreement among specialists comes late in the planning process when the specialists bring in their data to an approach where disagreement comes early in the process and precedes data collection. The ID team can discuss potential disagreements at the front of the planning process during identification of issues and decision criteria.

7. From permanent planning team membership to flexible team membership. The core planning team may be permanent, but it will draw in specialists to address various issues and concerns. In other words, a small group of people at the nucleus of the team will call upon a broad array of specialists who are geared towards issue-oriented planning, rather than having the same group of people handle every planning aspect.

8. From the planner doing all the planning to the planner as facilitator and coordinator of the process.

9. From a discipline orientation to a human-interaction orientation. This is not to imply that the disciplines will be any less needed, but the ability to work on a planning team will be emphasized in the new mode, whereas in the old, the specialists' skills in team work were not considered as important.

10. From line decisions coming at the end of the plan development to an approach where line decisions are built into the system at key points throughout the planning process. This approach should aid in keeping the plan effective and efficient.

11. From planning as a mechanism to defend or justify management actions to planning as a process for determining management actions.

Chapter 2

ISSUE IDENTIFICATION AND RESOLUTION

Chapter Organizer: Fred J. Wagstaff

Major Contributors: James Hagemeier, James Kent, Jo Anne Tremaine, Fred J. Wagstaff

National Forest System lands have always belonged to the public, but because the public's concerns and desires have not always been expressed openly, the land manager was often forced to deal with resources as he thought best. Now, though, the public is recognizing and demanding its right to participate in the land-management process, and, in response, listening to the public's concerns is a major emphasis of the planning regulations set forth in the National Forest Management Act. In fact, the first planning action in the planning process requires the identification of public issues, defined as subjects of "widespread public discussion or interest regarding the management of National Forest System lands."

Once these issues have been identified, they will not only guide the entire planning process, but they will also provide a basis for evaluating the effectiveness of a forest plan. Issues will help determine the goals to set, the areas of management to further analyze, the type and amount of data to collect, and the public participation needed to resolve the issues and complete the plan. Thus, early identification of issues is essential, since all other steps in the planning process are designed to resolve these issues.

Since most public concerns are social and economic ones, the disciplines of sociology and economics should be involved in issue identification from the beginning of the planning process. The sociologist and the economist can help the land manager focus in on public concerns since they are trained in identifying and predicting behavioral patterns and supply/demand trends, and have an ethical commitment to be objective. This skill is especially important when a concern exists about what future reactions to a situation might be.

MINERALS ISSUES

It seems likely that, in the future, the number of public issues demanding Forest Service attention will increase, primarily because there is a growing number of land-based conflicts. For example, the question of outstanding and reserved mineral rights will have a tremendous impact on the management of National Forest System lands, as will the increased demand for surface-area uses. Also, the public is more politically aware, sophisticated and concerned than it was in the past. Thus, it is crucial that the Forest Service consider these concerns at the beginning of the planning process rather than at the end of drawn-out legal procedures. The importance of recognizing public concerns is especially critical when minerals developments are involved. Often, for example, the minerals industry has been accused of abusing the legal rights it has under the General Mining Law[3]; and thus any mining activity will raise concerns with at least some segment of the public. In addition, the nature of mining makes it a highly visible activity. Mining development sometimes brings large population increases in a short period of time to communities that are neither socially nor culturally equipped to deal with such influxes, and the environment surrounding minerals developments can be substantially changed by the activity. Nevertheless, increased minerals development is almost inevitable because of society's increased demand for these products.

During the planning process, then, the land

[3]Act of May 10, 1872. 17 Stat. 91

manager should identify mineralized areas that are, or possibly will be, developed. Then, depending on the type of mineral, the type of mining and processing involved, and the area's current employment needs, potential minerals-related issues should be identified. The sociologist and economist can aid in identifying issues by determining the social, cultural, and political aspects of the area's current population, as well as whether the community's attitude is pro-growth, anti-growth, or a mixture of viewpoints. From this analysis, issues can be better focused on, deliberated, and perhaps even resolved. Guidelines for describing, determining, and resolving issues are discussed in the remainder of this chapter.

IDENTIFYING ISSUES

While it is impossible to eliminate national and regional needs when dealing with issues, issue identification generally focuses on local social and economic concerns, such as whether or not a minerals development will adversely affect an area's tourist economy. To learn about the public's concerns, the land manager should turn to the people of the community—those who are tied by economic, cultural, and physical boundaries to the site of the new development—for help. Forest Service personnel should also be questioned since they too are members of the community and are familiar with the concerns of the local population. Another key element to consider is the viewpoint of the absentee client, such as the urban resident who vacations in the forest, or a mining firm with headquarters in another State.

Basically, two types of networks exist that should be used in identifying issues: the formal and the informal. The formal network includes organized groups, such as recreational vehicle clubs and city councils, while the informal network includes the person in the coffee shop who is not making any requests, but is merely discussing his interests and how he feels the land should be managed.

Public issues can be divided into three stages of development. They are:

- **The emerging issue.** A topic of discussion or activity that may evolve into a demand by the public concerning forest or rangeland resources or programs.
- **The existing issue.** A direct public demand influencing forest or rangeland resources or programs.
- **The disruptive issue.** A direct public demand, on forest or rangeland resources or programs, that is beyond control of the resource manager at a given administrative level. This type of issue requires immediate management attention and action. With a disruptive issue, the public may take resource management into its own hands through such actions as tearing down fences or putting up barricades on national forest lands. Because this type of issue can develop into a crisis situation, management should respond, as much as possible, to emerging and existing issues to avoid their becoming disruptive ones. (See fig. 3.)

Any of the above issues can also be compound issues, which means that they are multi-jurisdictional and require action by agencies or organizations other than the Forest Service for resolution.

When determining public issues, it is important to separate these issues from management concerns. While both items can sometimes be interrelated, most management concerns are generated in administrative procedures. The primary distinguishing factor between the two is that unless a concern can be tied to the public, there is no issue; if a public tie exists, regardless of legalities, an issue exists.

To date, complete criteria for issue analysis have not been fully developed. Nevertheless, some guidelines for identifying issues have been established during the lead forests' planning processes. According to these criteria an issue should:

- Have potential or existing conflict.
- Have potential for a change in management plans.
- Have an effect on the allocation of resources.
- Deal with the here and now.
- Require a Forest Service role in resolution.
- Be capable of being written as a question.
- Be verifiable through public involvement.
- Be composed of subissues which are resolvable. If the subissues cannot be resolved by the

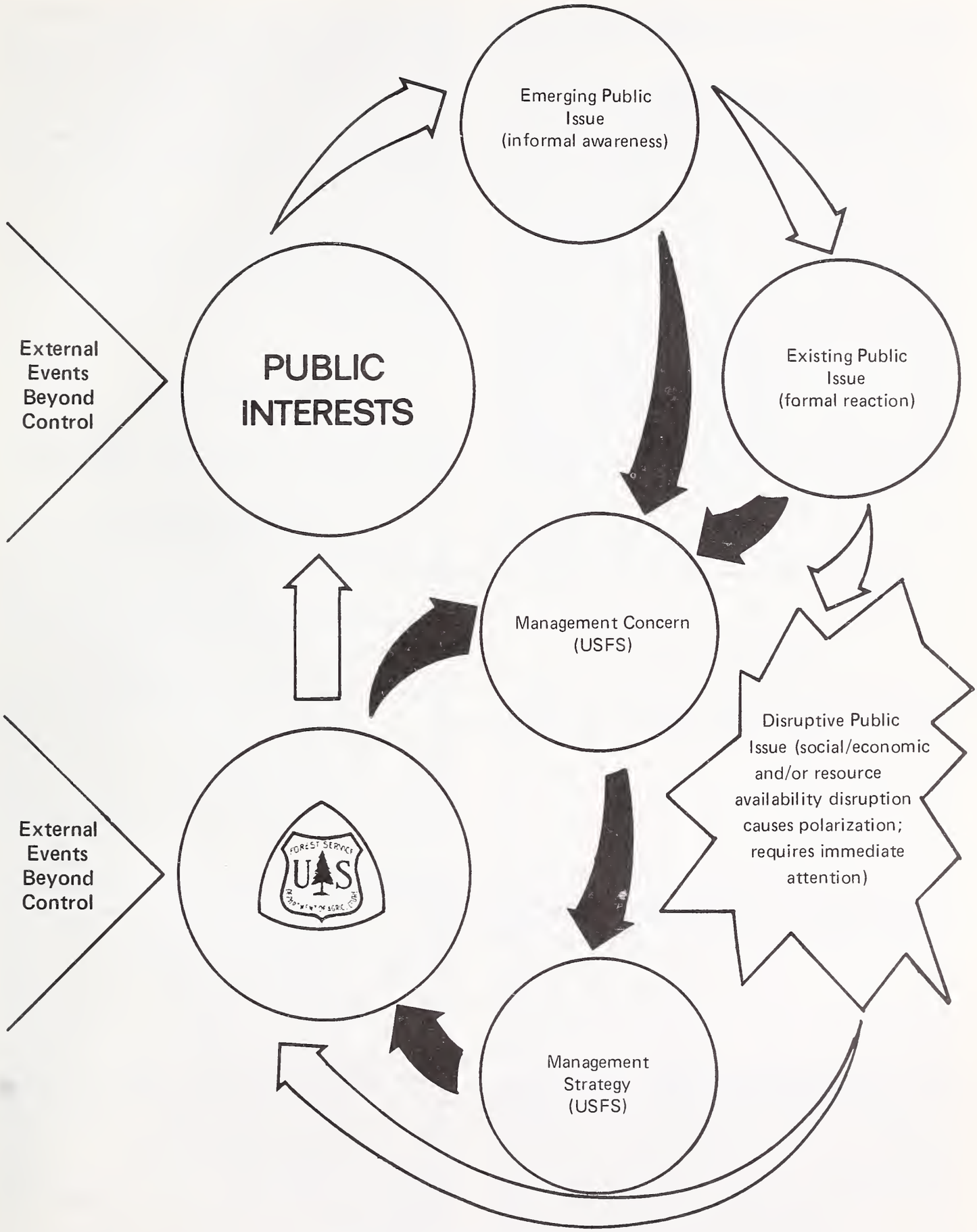


Figure 3. Responsive management system.

Forest Service or another agency or organization, there is no point in including the issue in the forest plan.

One process for determining public concerns was developed during the planning process in the Ottawa National Forest in Michigan. It involves the use of issue papers and direction memorandums (fig. 4). Through informal discussions with the public, Forest Service personnel returned to the public with an issue paper stating what they perceived as the primary concerns. After revising the statement to reflect concerns of this meeting, the Forest Service returned to the public once again for more input, and then produced a final paper that included consensus about which issues should be addressed. Resolving the issues took the form of a direction memorandum, with three different drafts. For the first draft, questions stated by the public in the issue paper were discussed with the ID team, and decision criteria pertinent to answering those questions were determined. Data needs necessary to solve a particular decision criteria were also determined at that time. Then the Forest Service returned to the public to find out whether, in fact, these were the items of concern, whether the decision criteria were appropriate, and whether any other decision criterion should be included. After incorporating this input, a final memorandum was drawn up. This process was the one used to develop the issue paper, and it lent credibility for the alternative formulation and trade-off analysis stage.

RESOLVING ISSUES

Once an issue or set of issues has been identified, it is necessary to determine whether or not

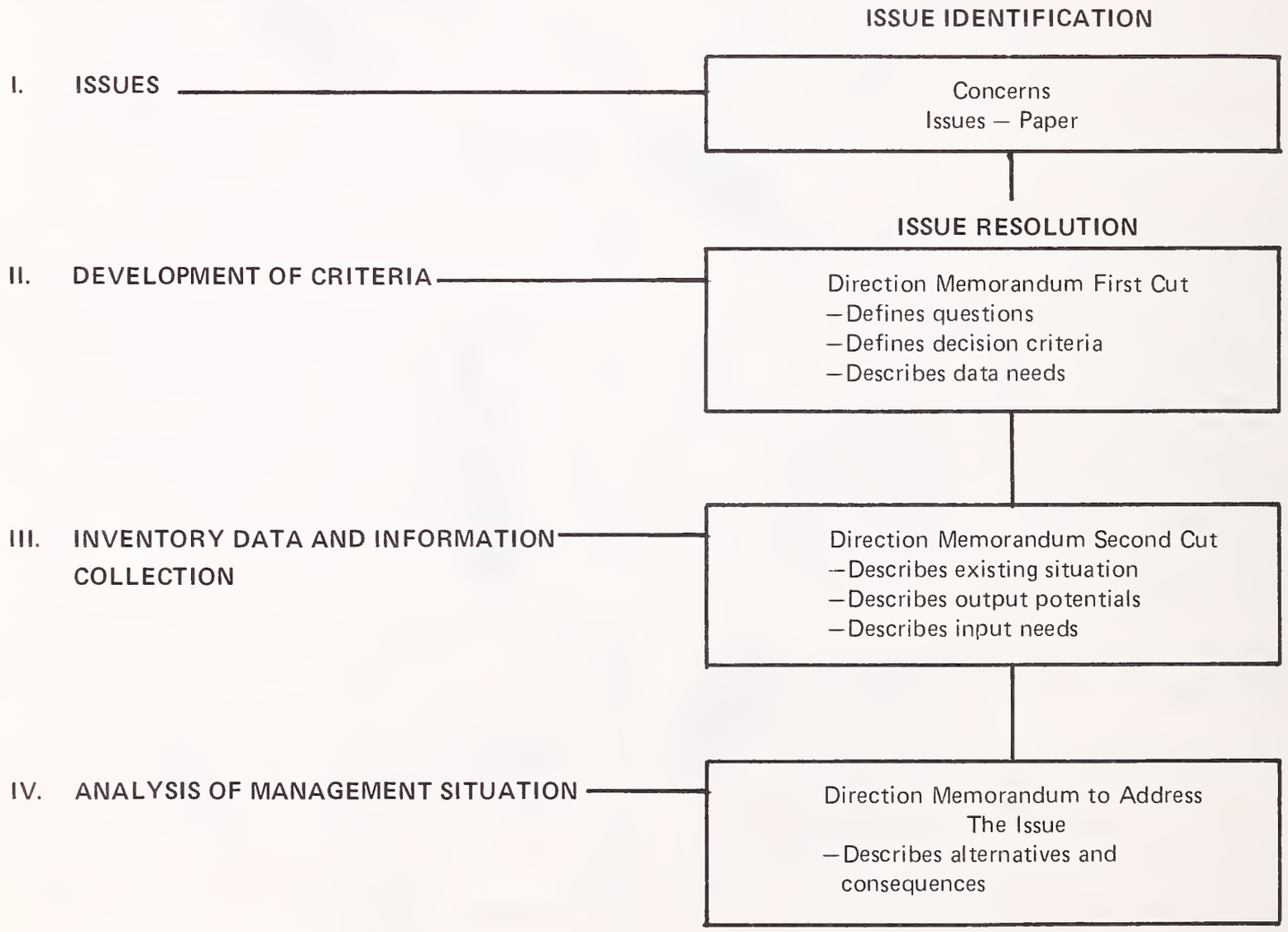


Figure 4. Issue scoping and resolution.

the machinery exists to resolve them. If an Environmental Impact Statement (EIS) containing planning criteria can properly address an issue, those steps should be implemented to resolve the issue. Currently, though, there are no EIS planning criteria, so all issues addressed by the first run of the planning process will require the development of criteria with full-scale public involvement. Then, to resolve identified issues, they should be reduced to specific questions that can be analyzed and answered. A limiting factor approach can be employed to narrow down the large number of questions that might result from a given issue, and only questions critical to resolving the issue should be answered.

Some criteria that might provide a basis for deciding which public issues to consider and which to ignore could include questions such as:

- How well does the issue relate to factors that the Forest Service manager can legitimately influence or directly control?
- How well can the issue be addressed by the Forest Service in terms of minimizing or avoiding social disruption?
- How well can the current budget pay for the cost of resolving this potential issue?
- What potential exists for public participation in the definition and resolution of this issue?

Once the issues have been narrowed down, they should be reviewed in light of Forest Service management goals, including policies, program directives, resource allocation, and performance requirements. Public issues that require immediate Forest Service attention should be distinguished from those that may need attention in the future.

After deciding which issues deserve consideration, the next step is developing a strategy to resolve them. At this point it is necessary to determine the organization or agency that has the authority to deal with each issue. Particularly in the minerals area, the Forest Service by itself often cannot handle the total issue. In administration alone, for example, there is a shared responsibility among the Forest Service, the States, and the Department of Interior for managing mineralized areas. And, if organizations other than the Forest Service are involved, they too must recognize the issue and their responsibility for a share of the resolution. In addition, there are some issues that can best be dealt with at a regional level, rather than at a forest level.

During this stage of the planning process, it will be important for the Forest Service to maintain communication with the public to minimize conflicts arising from issues. In the case of minerals development, this will mean demonstrating what can be done to minimize physical and biological impacts from mining, professionally evaluating social and economic impacts, and describing what the Forest Service can and cannot do to mitigate these impacts. For example, is it possible to resolve these issues or are the costs and side effects beyond the Forest Service's control? If not, what are the alternatives and tradeoffs? Sometimes it will not be possible to resolve all conflicts. But, including the public in the decisionmaking process allows for public understanding of the limitations of the Forest Service's capabilities as well as the demands that arise from other areas of the country on regional and national levels.

ISSUE EXAMPLES

When a proposed minerals development takes place, there are some issues and concerns that generally tend to surface. Often, the public's main concern centers around the question of whether or not mining should take place. This issue, though, is sometimes a false one. For example, in Gunnison County, Colorado, the issue at first appeared to be whether or not AMAX should be allowed to mine the molybdenum deposit under Mount Emmons. This issue was not within the jurisdiction of the Forest Service, because those lands are already patented and AMAX does have the right to enter and mine that particular body of ore. There was, though, a real issue revolving around the mining method. The company proposed a block-caving mining method—which could create potential subsidence—and no one was sure what the surface expression of this mining method would be in the future. Usually when people are concerned about the visual, environmental, and other aspects of landscape modification, an issue will be centered around the mining method.

Then, too, many issues revolve around the

milling process—that is, how will the ore be processed and where? One of the critical elements of milling ore is tailings management, since tailings dams are often sizable structures and many have failed. A series of issues also exists pertaining to reclamation. When is it going to be done, by whom, and for what purpose? More and more often the public is demanding a reclamation plan with a specific end use in mind; however, many State laws currently do not favor objective-oriented reclamation, and, instead, base requirements on native vegetation and original contour.

Another consideration is how the social and economic impacts of minerals development will be dealt with. To address this concern, the sociologist and economist must determine who will feel the impact of minerals development, how great the impact will be, when mitigation will be possible, and who will pay the costs. Strides have been made in requiring those responsible for minerals development to pay for some of the front-end mitigation costs; nevertheless, it is still difficult to determine what the total actual costs will be in the long run.

In a reversal of this concern, mine closings can also emerge as an issue. Although the situation is changing, in the Rocky Mountain area, most communities surrounding National Forest System lands have historically been low-income cultures. Thus, mine closings can have a significant impact on the economies of these communities, and it is necessary to examine the use of resources on forest and adjacent lands in a social context. It might, for instance, be possible to change the entire mode of timber operations so that increased timber operations coincide with mine closings. This would provide jobs for those people who have suitable skills. Should issues result in a change in management objectives, the disciplines of sociology and economics play important roles in proving the validity of these objectives. For example, harvesting timber during different times of the year to meet social goals might require a budget increase, and social/economic data will be vital in lending credibility to such a request.

Of course, issue identification and resolution are not static processes. They require constant monitoring. Over a period of time the physical, social, and economic aspects of areas surrounding Forest System lands will change. Some issues will be resolved, others will fade away, and new ones will emerge. Thus, social/economic concerns will need continuous reevaluation. But, by monitoring public issues, the land manager can insure that his land-use decisions are responsive to the needs and concerns of the public.

Chapter 3

SOCIOLOGIC AND ECONOMIC TOOLS FOR LAND MANAGERS

Chapter Organizer: James Kent

Major Contributors: James Kent, Richard Greiwe, James Hagemeier, Hanna J. Cortner, Julie (Marty) Uhlmann, Diane Hammond

As discussed in chapter 2, listening and responding to the concerns and demands expressed by the public are major stipulations of the NFMA. But even without these regulations, most land managers have realized that listening to the people who use and are concerned about the forest's resources is crucial to good land-management decisionmaking. Traditionally, the land manager has turned to the local community for its input. As a citizen of the community, he has understood what values were important to the people living near the forest and how these values affected the management of the public land under his jurisdiction.

The last decade, however, has seen the job of communicating with the public become increasingly more complex. As the country's population—and its consumption of natural resources—have boomed, demands on public lands have also skyrocketed. Where once a land manager faced a nearly homogeneous community whose interests could be satisfied with one or two resource development programs, today most forests are hit with numerous demands that can range from advocating all-out resource development to insistance on wilderness preservation at any cost.

To understand and manage these "people" pressures, social scientists and land managers have sought new ways to help them incorporate social and economic concerns—the concerns of people—into land-management decisions. This chapter will present three sociological models that have been developed to answer this need. They can be used by the land manager, sociologist, and economist to analyze social impacts and to predict social change as a result of mineral, recreational, or other resource development occurring on or near national forests or national grasslands. These models might be used by Forest Service staff to assess what effect forest planning and management will have on a community. Or, they might be used by a mining company who must include a social impact assessment as part of an Environmental Impact Statement or an Environmental Assessment prior to start up of mining operations on Forest Service land. In this case, the Forest Service sociologist and economist would suggest approaches to such an assessment and would review the results.

The fact that only three models are discussed here is not to imply that they are the best, or the only, models available to the sociologist. Rather, the intent is to illustrate how such models can help the ID team and the land manager to focus on issues—and thus why they are valuable tools in the planning and management of public lands.

THE HUMAN RESOURCE UNIT

One way of systematically looking at a society and the way change affects it is through the concept of the Human Resource Unit (HRU). The concept was developed by the Foundation for Urban and Neighborhood Development (FUND), Denver, Colo., under contract to the USDA Forest Service, SEAM program. The HRU process is currently being tested on several national forests as part of their land-management planning efforts.

The HRU is a concept of geographic decisionmaking that can be implemented by nonsociologists. For example, where a mining development is involved, the HRU will be the local area—the lands and communities—that are most closely intertwined and interrelated with the site of the proposed new development. In other words, an HRU is not an artificial, politically

created area, such as a county or township. Instead, it is the lands and the people tied by economic, cultural, and physical boundaries to the site of the new development. More formally, an HRU can be defined as:

> A geographic area of land that is characterized by particular patterns of cultural lifestyles, economic conditions, and topography. The HRU is used to design management actions that respond to changing social conditions or physical resource uses at the district or forest level.

As a simplified example, an HRU may be a mountain valley where the residents are mostly young and well-educated and the economy revolves around tourism. Or it may be a wide-open area on the plains where the people come primarily from Slavic countries, the social life revolves around their church, and the economy depends on wheat farming. Of course, such units are in a constant state of flux, changing with times, conditions, and particular issues. But for the land manager concerned about the effects of a specific resource development, the unit of land and people provides a much-needed source of information and issues, which he can then incorporate into his decisionmaking process.

IDENTIFYING THE HRU

In order to use the Human Resource Unit as a planning and management tool, the land manager must first determine where its boundaries lie. As previously noted, these boundaries do not fall along artificial, politically created lines. Instead, an HRU is a living, natural area, much like any ecological unit, except that this unit is bound together by people's relations to the land and to each other. In essence, the HRU is a survival mechanism—an area that people perceive as being integrally tied to their survival.

Because of the HRU's relationship to the land, and because people tend to settle within geographic boundaries, the HRU boundaries generally follow geographical features (such as a mountain range). As an example, if a community is being significantly affected by a mine, the boundaries of the HRU may run along the sides of a highway leading from the town to the mine site, or they may be drawn at the edge of a valley that includes both the community and the mine. The boundaries of the HRU include the entire area that primarily depends on the mine for its economic survival. An example of crossing political boundaries would be the case of a community in County A dependent on a mine in adjoining County B. In this situation, the community and the area surrounding the mine will be included in the same HRU even though the two are in different counties.

The boundaries of a Human Resource Unit are determined from observation and understanding of the area. The boundaries are identified, in fact, very much like the land manager might identify the boundaries of an ecological unit. To aid in this task, criteria have been developed to help describe or characterize an HRU. The characterization includes the cultural and economic aspects of the area. (Table 3 lists the key social variables used to describe the cultural and economic aspects of the HRU.)

Accurately describing these variables does require a certain amount of skill, for, to be of use, the description must detail and record the reality of the environment. Thus, the land manager may require the skills of a sociologist to help him fix the boundaries of the HRU.

- **The cultural description.** In order to determine what groups of people are linked together in the HRU, the manager must identify and summarize the characteristics of the people in a given geographic area to see if there are common traits. The information can be collected by observation, through existing publications and research, by informal contact with people, and by simply being a resident of the area. The cultural description should include: what kinds of people first settled the area; what kinds of people live there now; and why they came to the area. Work routines, land ownership patterns, recreational preferences, social networks, and the history and culture of the area are other important descriptors. The cultural description should also look at the people's perceptions of their community, themselves, newcomers, and change. From these descriptors, the existing publics can be identified. An existing public is defined as a specific part of a population that can be grouped together because of some common interest or purpose. Examples are networks of ranchers, loggers, small businessmen, or retirees.

• **The economic description.** The economic description concentrates on economic management systems and financial aspects of the unit. This characterization of the community would look at the average annual rate of population change in the HRU, mix of employment by industry, wage structure description, and size of reserve labor supply.

By writing down these descriptions, the forest manager will gain a useful insight into the area. First, the descriptions help define the unit boundaries, because they will clearly show which lands and communities are tied together by physical dimensions, history, culture, and economics. These descriptions will begin to reveal a great deal about how the people within the unit relate to the land—for example, whether they depend on it for agriculture or recreation, whether they see open space as an essential part of their lifestyle, or whether they would welcome growth to boost a dwindling local economy.

Of course, defining the boundaries of the HRU is only the first step in gaining these insights. To further understand the people in the HRU, the land managers must stay in touch with its communication networks.

Communication networks are the routine ways people share information. If the resource manager can stay in touch with these networks, he can maintain his involvement with the public and be better prepared to anticipate and handle issues that affect management of forest lands.

Communication networks can be broken into two types: formal and informal. Formal networks represent the organized, visible interests of the community. Types of formal networks include: economic networks, such as a labor union; ideological networks, such as a preservationist club; and formal political networks, such as county commissioners.

Informal networks also represent various types of interests; however, they are not as visible. Types of informal networks include: survival networks, such as people sharing a common occupation; cultural networks, such as extended families; and caretaking networks—those people in the community who are relied upon for advice or for help in time of need.

In addition to these networks, which are within the HRU, the land manager must be aware of external networks that will influence management decisions. Again, these networks can be formal or informal; the difference is that they might be regional, national, or even international in scope. An example of a formal network on a national basis is the Sierra Club. An informal network could be people involved in a

Table 3. — *Key variables used to characterize a Human Resource Unit*

Type of variable	Variable name
Cultural descriptors	Existing/future publics
	Settlement patterns
	Work routines
	Communication networks
	Supporting services
	Recreational activities
	Geographic boundaries
Economic indicators	Population change
	Employment mix
	Wage structure
	Local labor supply
	Input-output ratio
	Capacity of government services

certain type of recreation—for example, backpackers and cross-country skiers who are from an urban area outside the HRU, but who use the forest.

Once these networks are identified, the resource manager will have a better grasp of the kinds of publics he must deal with, and the people he can go to for opinions or direction in resolving issues. One way to keep in touch with these networks is to develop a "key contact list." Such a list not only includes politicians and sportsmen's clubs, but also the key people in the informal networks.

EXPANDING THE BOUNDARIES

The HRU concept can be expanded from the local community that is tied to a forest to a wider area of people tied to a region. This broader area, known as the Social Resource Unit (SRU), can be used for regional planning. In both cases, however, it should be realized that the boundaries set up to characterize either the Human Resource Unit or the Social Resource Unit are fluid—the lines change with issues and management concerns. For example, at times, the interested publics may extend to a regional, national, even international level. Thus, the HRU or SRU must be constantly monitored for alterations in the boundaries. The precise boundaries, however, are not so important as is the fact that this approach helps the land-management team become more sensitive to human concerns.

As noted at the beginning of this chapter, the HRU and corresponding SRU are tools that can be used by nonsociologists. A sociologist or economist, however, is valuable in initially helping the land manager set up a system for identifying the HRU. To do this, the sociologist should submerge himself in the culture while he is working with the land manager to develop the HRU. Then, the process and the results should be documented so that the procedure can be followed when the sociologist is no longer on the scene. In this manner, a new manager assigned to the area can be brought up to date on the characteristics and key concerns of his publics much more quickly than if he were left to his own devices. In other words, the HRU can be taught to a nonsociologist, as well as implemented by this nonsociologist, and the knowledge can then be readily transferred to new members of the team.

HOW THE HRU IS USED

Once identified, the HRU becomes useful both for planning and day-to-day management. In general, it can serve three broad functions:

- Knowing the publics that use the forest, which results in better management.
- Providing a way of implementing the first step in forest planning: issue identification and evaluation.
- Providing a data base that can be used for social impact assessments in completing Environmental Assessments and Environmental Impact Statements.

The HRU can serve these functions because it will help determine how the people of an area relate to and rely on the land; how new developments may affect these people; and finally, how the community will respond to planning and management decisions on NFS lands.

- **Public involvement.** Although Forest Service personnel have traditionally communicated informally with the publics using the forests, in recent years this informal give and take has evolved into more formal methods of communication. Because of this, the land manager in many cases has lost a "feel" for the community—a decided disadvantage when he is trying to identify issues during the planning process.

The HRU helps the forest manager regain a firm grasp of the nature of the people the forest serves by helping him become more involved in the area's communication networks.

Through these networks, the land manager can:

- Identify emerging and existing public issues.
- Inform people of resource management activities.
- Become informed about each public's interests regarding resource management.
- Dispel rumors about the agency and its activities, and educate people about agency concerns.
- Involve people informally before formal public involvement occurs.
- Understand how each public is affected by resource management plans.

• Insure that all involved publics are represented in the decisionmaking process.

In other words, because of his knowledge of the HRU, the forest manager will establish contacts with his public and gain a better understanding of what his role should be in managing the forests. He will also be less likely to focus only on internal management concerns. The HRU structures the manager's public involvement and provides a framework for quickly familiarizing the new manager with the characteristics and communication networks of the community he has moved into.

• **Issue identification.** Once communication networks are identified, the manager will learn what the public interests are. If he can manage in harmony with these interests, he can reduce the number and seriousness of issues. For example, if people like to fish, he provides fishing opportunities. If people like to hunt deer, he increases deer habitat. In other words, the resource manager uses the communication networks to find out what the people's interests are and, if possible, responds to them before they become issues.

Of course, rarely is managing public lands this simple. In many cases, the land manager *will* be faced with issues. But if he can address these issues before they become disruptive, he will be a more effective manager and provide better public service.

Knowledge of the HRU's characteristics and its communication networks will also insure that the ID team considers issues from all the existing publics, instead of just one vocal group. And, of course, the HRU provides a framework in which the manager can monitor an area and stay on top of emerging issues.

• **Social impact assessment.** The HRU can be used as the first step in a social impact assessment. A social impact assessment (SIA) is a systematic procedure for determining and predicting the cultural, institutional, and political conditions of a specific geographic area, and the way this area will be affected by specified changes. An SIA is often used when a mining development enters an area.

As set up by the social scientists who developed the HRU, 10 steps are necessary for completing a social impact assessment (fig. 5). For administrative reasons, it may be necessary to take the steps rapidly or to eliminate some steps altogether. But the more thorough the SIA, the better the results.

The 10 steps are grouped into three phases: (1) past/current situation; (2) future situation; and (3) management direction. Four steps are involved in analyzing the current situation; they provide baseline information about the HRU. With this "social" baseline established, the three steps used to characterize the future situation will help predict social changes resulting from proposed resource developments.

Finally, the three steps in establishing management direction will translate the results of the first two SIA phases into a basis for Forest Service action. The action proposed in this third phase of the social impact assessment should provide a practical alternative for allocating forest resources in ways that minimize the negative impacts of resource developments. During this phase, the manager should be able to plan ways to harmonize the natural environment with the proposed mineral, recreational, and/or other resource development activity.

The 10 steps in the SIA process involve:

1. Characterize the Human Resource Unit using cultural descriptors.

This step was discussed earlier in this chapter.

2. Characterize the Human Resource Unit using economic indicators.

This step was discussed earlier in this chapter.

3. Describe the relationship of the current situation to forest resources.

The purpose of this step is to identify the way residents and nonresidents of the HRU use forest resources. The relationship between people and the resources must be understood before the manager can begin to determine how the development force might interrupt that relationship.

Tasks in this step involve:

• Completing an inventory of each resource program output on the forest.

• Identifying uses of each resource program by resident and nonresident publics.

• Identifying demands on each resource program by resident and nonresident publics.

4. Describe the nature of the resource development force.

The principal characteristics of a resource development force are that it is sizable, will cause profound change, and will directly or indirectly impact management of the forest or the social

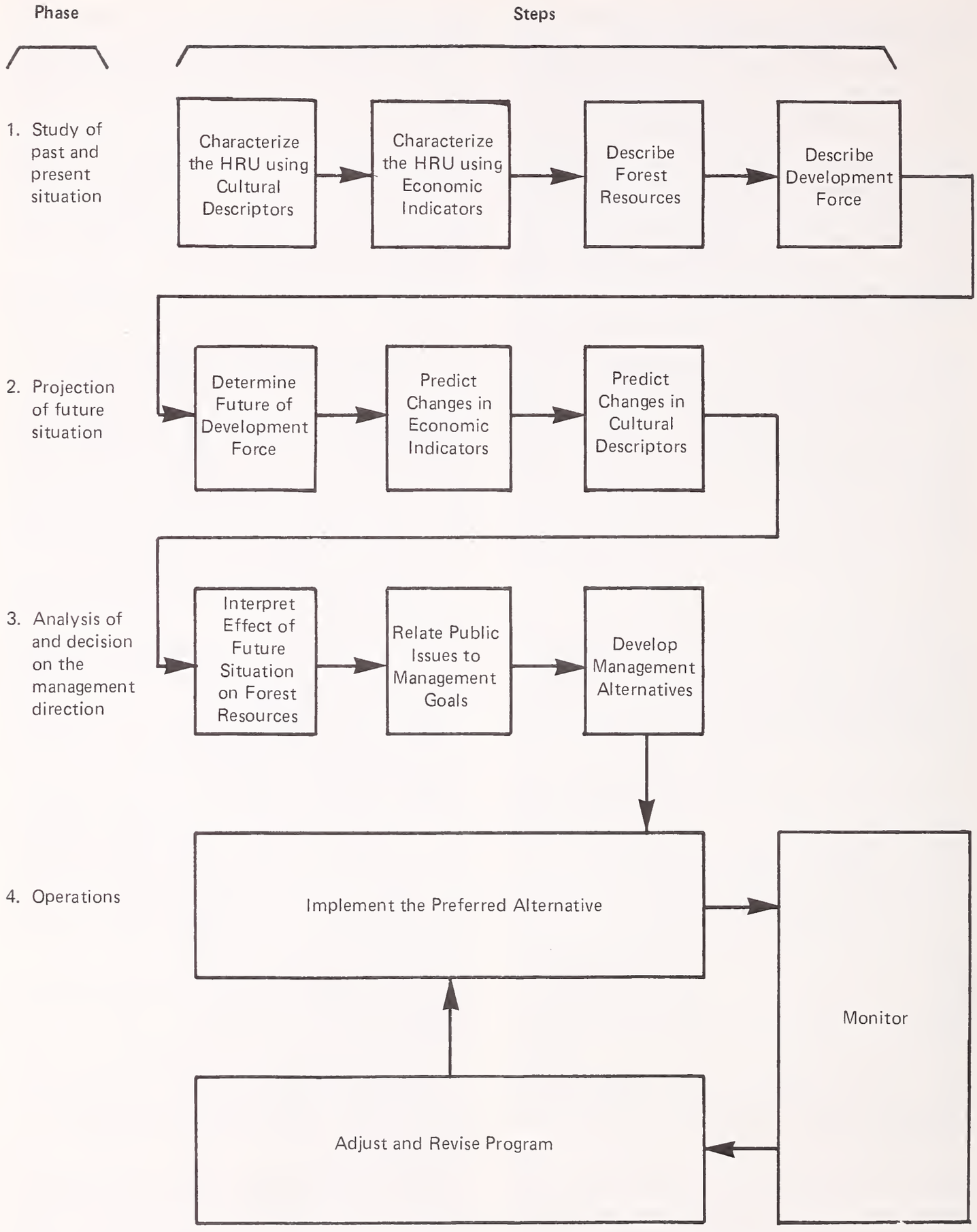


Figure 5. Steps in a social impact assessment (as related to the Human Resource Unit).

structure of the community. This step will help the manager determine the level of Forest Service involvement and when a management position must be taken.

Tasks include:

- Describing the location, type, size, and demand for the resource.
- Describing the technology and manpower employed in the resource development.
- Describing the practices and policies of the resource development.
- Describing the current phase of resource development.

5. Determine the future of the resource development force.

In moving from one phase to the next, a resource development activity, such as mining, must pass through very standard operations—for example, applying for permits, obtaining water rights, hiring miners. These procedures usually go unnoticed by resource managers until a crisis occurs. To prevent crises or minimize social disruption, it is important to understand that these activities ultimately will have an effect on an HRU. The impacts of concern to the resource manager are the direct effects of the industrial use of the forest and the indirect effects of a new population living near the forest. Thus, this step involves digging into the details of proposed or actual resource development plans and preparing for the next wave of change.

Tasks include:

- Estimating the timing of the future resource development phases.
- Charting the requirements for completing each resource development phase for 5-, 10-, and 20-year periods.

6. Predict changes in the economic indicators.

In this step, economic indicators are used as forecasting tools to signal rapidly changing situations.

The economic indicators used in step 2 to describe the present economy should be monitored for change. When analysis shows that these economic indicators are expected to move outside the normal range, the manager should begin to look for changes in the cultural descriptors.

Tasks in this step include:

- Predicting the rate of population change in the HRU.
- Describing changes in the mix of employment.
- Describing shifts in the average wage pattern in the major industries.
- Estimating the labor supply.

7. Predict changes in cultural descriptors.

The economic indicators only warn the resource manager that the economic conditions in an HRU will change with the resource development force. Changing economic conditions, in turn, set in motion a series of changes in the cultural conditions of an HRU. Therefore, the resource manager must reexamine the cultural descriptors characterized in step 1 to determine if the resource development force is creating positive or negative effects on the community.

Tasks include:

- Assessing the implications of change in the economic indicators for the cultural descriptors.
- Characterizing the HRU using the cultural descriptors in 5-, 10-, and 20-year periods.

8. Interpret effect of future situation on forest resources.

The results of steps 6 and 7 provide the manager with a basis for projecting future demands on the forest. This is essential to the resource manager who wants to stay in control of, rather than be controlled by, the rapid changes resulting from resource development.

Tasks include:

- Assessing the changing demands in each forest resource program for 5-, 10-, and 20-year periods.
- Predicting future issues for each of the existing publics associated with the resource development force.

9. Relate public issues to management goals.

This step provides the manager with the crucial link between study and action in a social impact assessment. Up to this step, the essential tasks led to the development and refinement of his knowledge of the HRU and the change occurring in it. Now, he translates the results of steps 1 through 8 into a form that means something from a Forest Service management perspective.

Tasks involve:

- Establishing criteria that will be used in screening out public issues that relate to management goals.
- Screening out public issues that satisfy the criteria.
- Reviewing Forest Service management goals for the HRU in light of the public issues

screened out for special attention.

- Listing public issues that are harmonious with current Forest Service management goals for the HRU.
- Listing public issues that are ignored by or are in conflict with management goals for the HRU.
- Conferring with informal and formal leaders of existing publics in the HRU to obtain their input to the final selection of public issues.
- Distinguishing public issues requiring immediate Forest Service management attention from those that should be addressed in subsequent years.

10. Develop alternatives for management action.

This step is concerned with the establishment of several real alternatives to address how public issues will be integrated into management directions.

Tasks include:

- Identifying alternatives for action on public issues.
- Identifying favorable effects and unfavorable effects related to each alternative.
- Developing a tradeoff schedule for each alternative.
- Identifying costs for implementing each alternative.
- Identifying local agencies, citizens, or Government agencies that have primary and secondary responsibility for carrying out the alternatives.
- Conducting a formal public review of alternatives.
- Selecting and implementing a social impact management plan.

By using this approach, the social impact assessment will achieve the following goals:

- It will assure public involvement.
- It will enhance understanding of tradeoffs for each public.
- It will minimize surprises.
- It will distinguish local, regional, national, and international interests.

For more information on the Human Resource Unit concept and how it is used in planning and management decisions, refer to a report titled "An Approach to Social Resource Management," by James A. Kent, Richard J. Greiwe and James E. Freeman, Foundation for Urban and Neighborhood Development, Inc, and John J. Ryan, The John Ryan Co., for USDA Forest Service, Surface Environment and Mining Program. January 1979.

ANOTHER APPROACH TO AN SIA

A slightly different approach to social impact assessments has been developed by the Denver Research Institute (DRI), Denver, Colo. It is briefly summarized here to show the similarities and variations between it and the HRU approach to a social impact assessment.

As used by DRI, the social impact assessment follows these steps:

1. Determine the characteristics of the community and development project.

Community characteristics include size, previous level of development, location, quality of public and private facilities, and support systems. Characteristics of the development project can include ownership, capital investment, labor needs, duration, and rate of development. These determinants indicate vulnerability, but do not forecast change.

2. Set up procedural requirements to follow in assessing change.

This should include:

- Identifying different types of changes, opportunities, and problems expected.
- Developing estimates or indicators of magnitude or severity of the change.
- Developing a method for forecasting and monitoring/responding to expected changes.
- Assessing state-of-the-art for classifying these changes and identifying which impacts will occur for specified developments in specified communities.

Because there are few formalized models for making these assessments, a heavy reliance on forecasting by analogy will probably be necessary.

3. Develop anticipatory techniques.

This step includes:

- Developing a parties-at-interest checklist.

Here, the sociologist would identify the actors and stake-holders in the area being studied. These parties consist of: parties internal to the affected industry, such as owners, employees, stockholders; suppliers and customers

of an affected industry; competitors of an affected industry; government; and affected by-standers, such as residents, property owners, and resource users. Developing this list is useful for highlighting different levels of government and society, political relationships, and unique situations.

• Developing an impacts wheel.

DRI's impacts wheel is an application of the future wheel developed by Joel Barker, Jerry Glen, and Billy Rojas at the University of Massachusetts, Amherst[4]. In this procedure, a generalized statement of the impact from whatever development under study is made and placed in a centered circle. From that statement, positive and negative impacts branch out in circles. These circles can go to second and third order impacts. For example, a generalized statement of impact might read: "Reduced quantity and quality of public service resulting from growth in population." A first order spinoff might be: "Reduce schools' quality and resources." A third order impact might be: "Higher teacher turnover." (See figure 6.)

Using this tool helps the sociologist focus on the relationships and consequences that may result because of an expected impact. The tool could be used in a public involvement situation or with other members of the Forest Service staff in order to discover problem areas or concerns.

MODEL OF CULTURAL ECOLOGY

The model of cultural ecology is a conceptual approach that has been used successfully by anthropologists to analyze human groups, and has applicability in social impact assessments as well. This model provides a rationale for evaluating various checklists (such as the cultural and economic descriptors of the HRU), and understanding relationships between various aspects of the organization of human groups. It can help determine, for example, whether economic variables should be considered first, or whether political or ideological variables take precedence. It also provides a theoretical framework for relating the variables.

The following provides a general outline of this concept; see figure 7 for a diagram of the model:

1. **The basic premise of the cultural ecology model is that human groups are best understood as adaptive units.** That is, their primary purpose is to provide a vehicle for adaptation to the environment. The two important aspects of the environment to which groups must adapt are the natural (physical) environment and other human groups.

2. **The human group—for example, a community—is analyzed as an adaptive unit in terms of four major categories:**

• The subsistence base or the economics of the group. This includes factors such as employment base, level and distribution of income, characteristics of production, and ownership of resources.

• The social structure. This includes such factors as type of kinship organization, social stratification, demographic structure, voluntary organizations, and organizations that promote social well being.

• Political organizations. Governmental entities and informal opinion leaders are part of this category.

• Ideology. This includes the group's values, norms, expectations, beliefs, and aspirations.

3. **Of the above four categories, the subsistence base is assumed to have priority, because it is the first order of adaptation to the environment that a human group must make in order to survive.**

4. Two implications of this model for predicting people-related impacts are:

• The analysis begins with an examination of environmental factors that impinge on a group.

• The analysis of the group itself begins with an analysis of the subsistence base, or economic variables. It is predicted that as the subsistence base changes, the social, political, and ideological structures will also change. In other words, this model is based on the assumption that social, political, and ideological structures are more affected by changes in subsistence than the reverse (although there are some exceptions to

[4]Joel Barker, Jerry Glen, and Billy Rojas developed the future wheel while doing postgraduate work at the University of Massachusetts, Amherst, in the late 1970's. No publication of their work is known to exist.

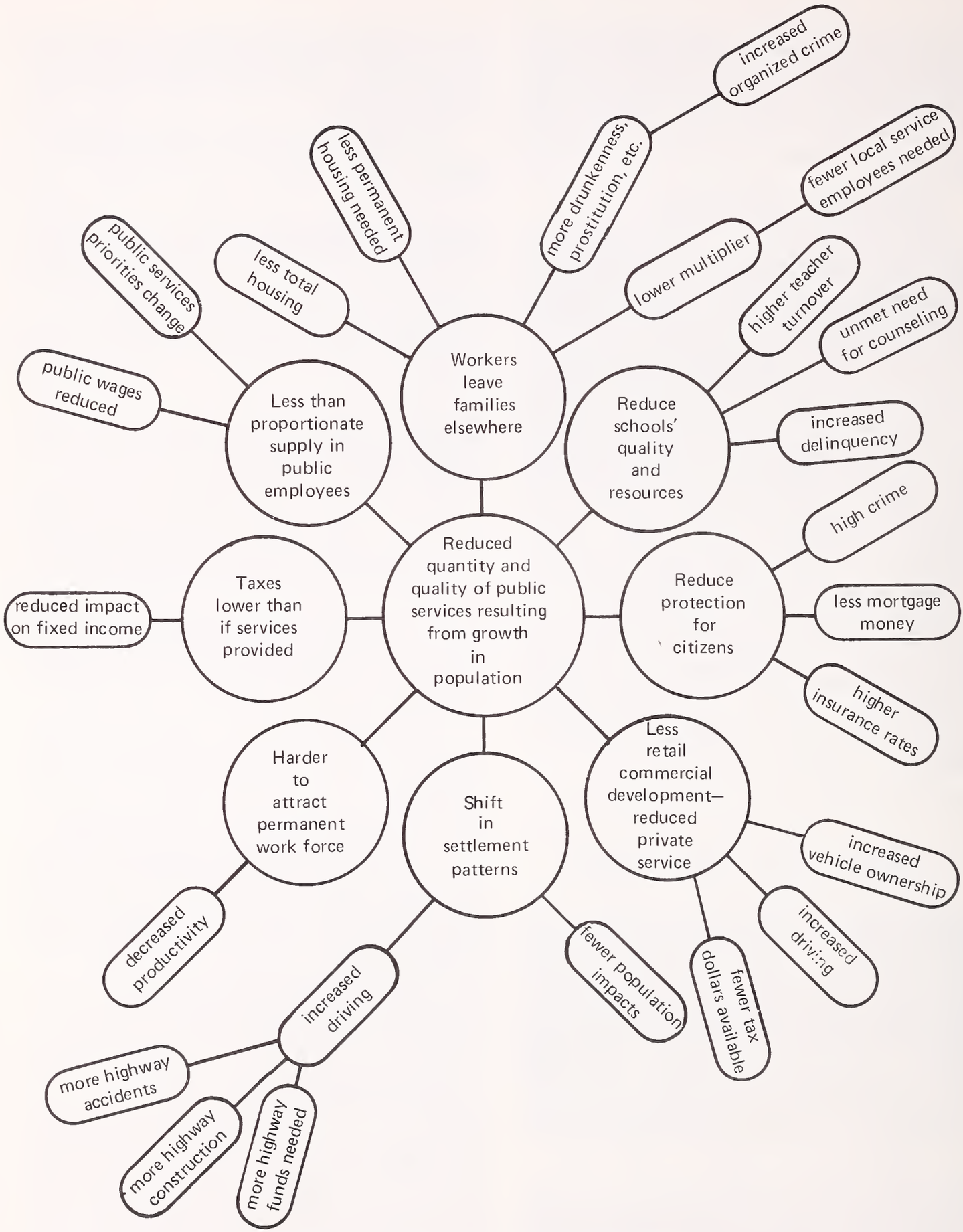


Figure 6. Impacts wheel. (Denver Research Institute)

THE ENVIRONMENT

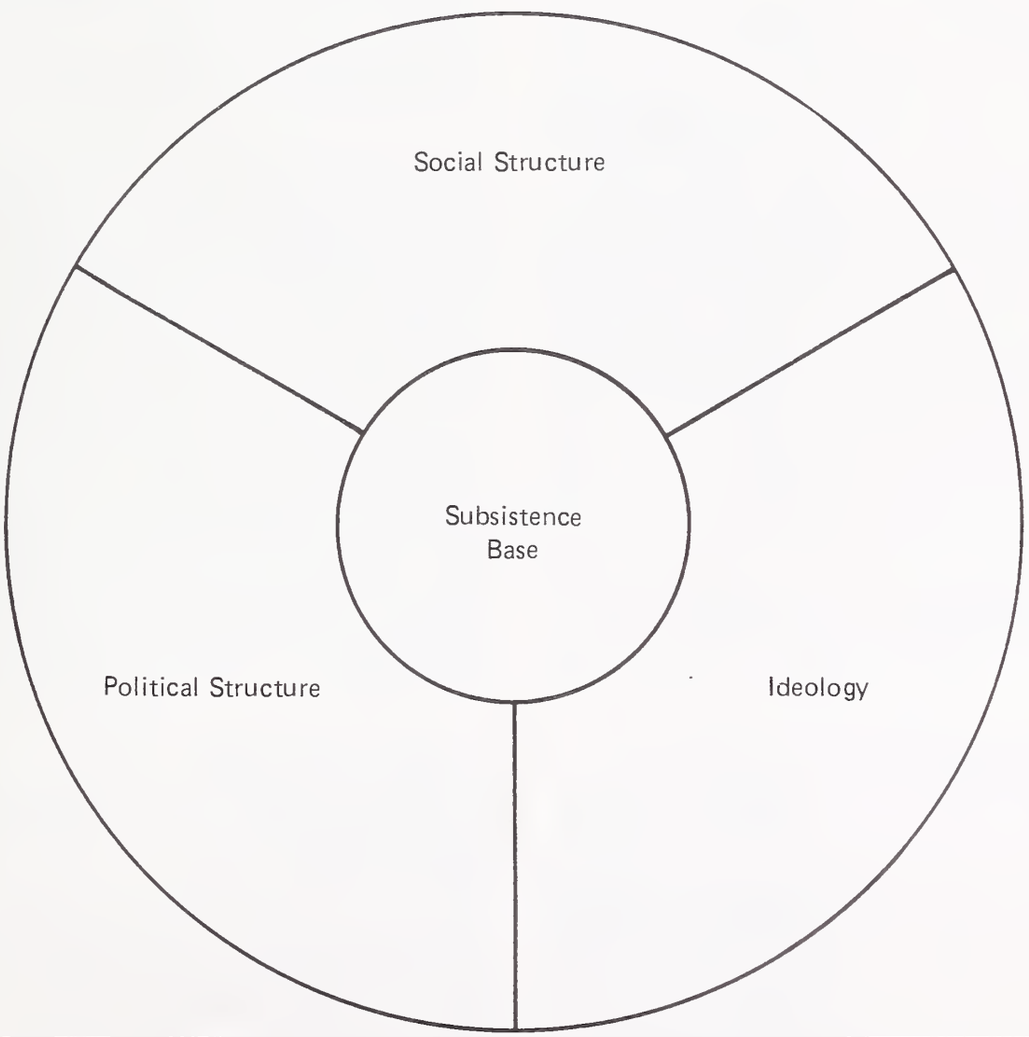
1) Natural Environment of Affected Region

Amount of water
Distribution of natural resources, etc.

2) Extra-Local Human Groups[1]

Interest groups
Impacting industry
State/national Government, etc.

THE HUMAN GROUP



[1] Extra-local groups are defined as groups that set policies or have perspectives or significant behaviors outside the impacted area that help set the parameters, tone, and pace of change.

Figure 7. Model of cultural ecology.

this assumption). An example of how change in subsistence might affect the overall characteristics of the group is provided in table 4.

Thus, the model of cultural ecology directs that a social impact assessment begin with an analysis of the subsistence base. From this analysis, the sociologist can begin to predict what types of social structures, ideological arrangements, and political organizations will flow out of the subsistence base described.

Table 4.— *Illustration of the effects of a change in subsistence on social structure, political organization, and ideology*

Subsistence	Social Structure	Political Organization	Ideology
TIME 1			
1. rural agricultural economy 2. family as the unit of production and ownership	1. demography: small population size 2. family is the major household unit 3. little elaboration of organization to promote social well-being (family performs these functions) health mental well-being social well-being recreation safety etc.	1. rural interests influence decision-making and hold power e.g., county commissioners	1. value of individualism 2. personalism
TIME 2			
1. resource development occurs: coal, oil, gas, uranium 2. resource firm as unit of production and ownership	1. demography: increased population size 2. household unit family single individuals 3. development of public organizations (institutions) for health mental well-being social well-being recreation, safety, etc.	1. extra-local groups become increasingly important 2. industry and other professional personnel assume local political roles	1. attitude of willingness to rely on institutions rather than self or kin 2. impersonality develops

Chapter 4
THE ROLE OF THE ECONOMIST

Chapter Organizer: Ed Thor

Major Contributors: Ed Thor, Dick Dyrland, Larry Dale

In recent years, the Forest Service has become increasingly aware of the present and future values of minerals contained within NFS boundaries. As a result, more emphasis is now placed on identifying mineral deposits, comparing their value to other resource values, and estimating the potential and timing of their development.

In this context, the role of the economist is also gaining more prominence. Not only can he bring expertise to the job of calculating the overall value of minerals on forest lands, but he can also work with minerals specialists to evaluate proposed mineral developments, both from a strict dollar estimate of costs and revenues and from a more judgmental benefit/cost study. In regard to a specific mineral development, the economist might be asked to apply his skills in determining the costs and revenues of the mining development for the Forest Service, or the costs of various reclamation plans that other members of the interdisciplinary team recommend. He may also be asked to participate in reviewing a mining operator's economic impact assessment, if this study is required.

But because there are numerous approaches to these types of economic studies, both the economist and the land manager must be aware of the philosophical base of the economist. Perhaps more than any other science, economic analyses and predictions are inseparably tied to the conviction of the economist that he either can—or cannot—step into the realm of value analysis and behavior predictions. In fact, underlying many economic tools are basic value judgments of how the world is—and how it ought to be. Depending on their decision on what tools they will use and what they will measure, several economists can interpret data quite differently. Thus, the economist must explain—and the land manager must demand to know—what value system and judgments underlie the economic analyses. And, of course, the philosophical bias of the land manager will dictate what functions he may ask the economist to perform for the interdisciplinary team.

Therefore, the land manager and economist must work together to establish goals and methods of analysis. If there is a staff economist assigned to the forest level, he must become grounded in the types of information his manager needs. If the economist is on loan from a Regional Office, he will need the same type of initiation. If the forest manager decides to let a contract for an outside economist to do a specific job, he should identify in the contract the types of skills and methodologies he will need. And, if a specific mining development is under study, the land manager and ID team may work with the mining operator's economist to help him understand what type of economic information will be necessary to make a decision on the development and reclamation of that site. Similarly, the economist must assist the manager in understanding the types of economic information that can be made available, and their implications for decisionmaking.

This chapter focuses on five areas in which the economist can provide expertise: cost and revenue analyses, value analyses, decision rules, behavior predictions, and economic impact assessments. A discussion of how the economist's skills can be put to use in inventorying minerals values on forest and national levels is also included.

COST AND REVENUE ANALYSES

Cost and revenue analyses are the most fundamental jobs an economist is trained to per-

form. In these analyses, the economist tries to pin down technical facts. For example, he would look at actual dollars and do a budget analysis.

Assessing supply and demand is part of this function. As part of the supply analysis, the economist can judge what the project or commodity under study will cost, what price/quantity relationships exist, when the supply will be available, and who will bear the costs.

Demand analysis will include: how much people will pay for the commodity; the price/quantity relationship; who will buy; how much and when they will buy. From this analysis, the economist can estimate relative and total costs and revenues of a development.

In regard to minerals developments, the economist should be aware that violent price fluctuations of mineral commodities are always possible, caused by such factors as international monetary exchange rates, foreign revolutions closing key mines, environmental pressures that lead to more stringent reclamation standards, and overall business cycles. Only for the short run can supply and demand be considered stable. On the demand side, this is generally true because industries using minerals as raw materials may have fixed their needs for several years into the future and will not quickly change them. On the supply side, the lead time required to discover, delineate, and develop new production facilities prevents increases in supply in the short run.

VALUE ANALYSES

Value analyses go beyond the technical facts to estimate the worth or social value of the commodity or development. The same methodologies applicable to cost and revenue analysis can be used, but in a value analysis, the economist addresses social values and social welfare questions. For example, he might set a dollar value on nonmarket goods, such as wilderness areas or on the use of the forest for recreation. He might use the tools of welfare economics to help clarify the comparison of health risks to economic gains. Value analysis looks at what tradeoffs must be made if a development takes place. From tradeoff analysis, the economist can determine relative cost/benefits. This type of analysis can be highly judgmental, depending on how it addresses social welfare questions. Thus, it is important for the land manager and economist, as part of the interdisciplinary team, to work together to set up planning objectives and criteria for both what will be measured and how it will be measured.

DECISION CRITERIA

This area of expertise relates directly to step 2 of the planning process. And, because economics is often called a decision science, economists will have the specialized rules of behavior and analytical tools necessary for helping the land manager establish decision criteria.

Economics in general is oriented around concepts such as efficiency, finding the optimal solution to a set of decision criteria, maximizing benefits, or minimizing costs. Some types of decision behavior will lead towards these results even though the decision to be made is too complex to be based on any single analysis or index such as a benefit/cost ratio. One of these types of behavior is structuring a detailed tradeoff analysis. Another, and perhaps a fundamental behavioral principle, is to make decisions at the margin. That is, to examine the change in output caused by small changes in activities—rather than comparing total outputs and costs—and make decisions accordingly.

Similarly, the economist's specialized analytical tools, such as benefit/cost analysis, mathematical programming, and operations research techniques, will assist in both setting up the decision criteria, and then analyzing how well the different alternatives meet the criteria.

BEHAVIOR PREDICTIONS

The economist may be able to predict behaviors both for the economy as a whole—called macro-economics—and for a single firm or single industry—called micro-economics. The economist can take supply and demand information, and, using some judgment, determine answers to questions such as: When will industry show an interest in developing a mineralized site? Who will be involved? Where will it take place? Why and how? In other words, he will analyze supply and demand and predict at what price it is eco-

nomically viable to develop certain deposits. He can then tie this into the location of the deposit most likely to be mined, assess what technology might be used, and make a preliminary estimation of the impacts that will result—changes in income, tax base, etc. And, he can predict what causal mechanisms will result in a change in direction toward developing the deposit.

Of course, many factors beyond the control of either the Forest Service or the mining operator can change supply and demand curves over the long run. Thus, these predictions must constantly be evaluated for their validity.

ECONOMIC IMPACT ASSESSMENT

If a resource change will occur—for instance, a mine will be developed—the land manager will need to know how to predict supply and demand changes in the forest as a result of new wage structures, added population, and/or new recreational preferences. The economist can aid in this evaluation by doing an economic impact assessment, which can be tied into the larger social impact assessment discussed in chapter 3.

An economic impact assessment is comprised of three parts: budget and fiscal impacts, economic activity impacts, and economic and social structural changes.

- **Budget and fiscal impacts.** These impacts are assessed from a strict dollar aspect and can look at the forest's district office, supervisor's office, local Governments, and organizations and firms.
- **Economic activity impacts.** The economist can predict the ripple effects the resource development would have on the economy as a whole as a result of its development.
- **Economic and social structural changes.** Again, this analysis focuses on what will happen as a result of development that will affect how the people in the community will earn their living.

The economist can predict where prices, industries, employment patterns, and incomes will change. He can identify changes in income distributions. In terms of the model of cultural ecology presented in chapter 3, he can identify changes in the subsistence base. These changes will lead to a different economic and social structure in the community, different economic and social roles for individuals within or coming to the community, and different community power bases. Thus, the economist can work with the sociologist in predicting social changes.

This kind of analysis will help the ID team anticipate issues, and thus points out the important role the economist can play in issue identification. In other words, his economic analyses can provide the manager with information on changes in: tax base, income levels, wage structures, price levels, employment rates, and changes in types of industries, levels of economic activities, or types of workers. All of these changes can cause issues to emerge.

PREDICTING MINERAL VALUES AND DEVELOPMENT POTENTIAL

On a forest, the tools of the economist can be used to place a value on the minerals within the forest's boundaries and to predict when these minerals might be developed, in what sequence, and at what price. This information will be valuable to managers who are now being directed by various regulations to decide how mineral deposits on public lands will fit into the overall land-management plan.

The value of a deposit is based in part upon the ore grade and the cost of production per ton. Other factors being equal, the higher the ore grade, the less costly per ton it will be to mine. Some organizations have attempted to evaluate mineral deposits using ore grades and other features of the deposit. For example, the Bureau of Mines has looked at some 20,000 mineral deposits around the country and has estimated how expensive, in a strict economic sense, it would be to mine these deposits. The resulting information is compiled into the Minerals Availability System (MAS). If similar information can be compiled on a forest level, the mineral deposits in a forest can be compared to those of the nation to estimate their comparable rank. Then, after comparable values are determined, the economist can estimate the demand to develop and use these deposits. From this, he can predict when the various deposits might be mined and what value that mineral deposit will have at the time of mining. Of course, such an analysis is subject to error because of the volatile price fluctuations mineral commodities can take,

and the fact that demand for a certain mineral may change over the long term.

An estimation of the effects of not mining in the sequence of least cost to most cost should also be made. For example, if social values dictate that a mine should not be developed, not only will the next least-expensive deposit of the same mineral be more expensive to develop, but also, society will come to the end of the supply more quickly. The benefit of skipping over this mine, then, must be looked at in terms of its present effect on the economics of developing the next mineral deposit, and the future impacts of not mining it.

Finally, from the information gathered up to this point, the economist and land manager can compare the value of developing mineral resources to the value of other resources and make tradeoff comparisons. This type of economic information helps the land manager, economist, and other members of the ID team budget and project outputs and targets for the 50-year planning period prescribed by the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974.[5]

ECONOMIC SKILLS AND RPA

Under RPA, an assessment of the National Forest System's renewable resources must be made and used as the basic information for planning.

As amended in the National Forest Management Act (NFMA) of 1976, RPA directs that planning for resource allocations requires: (1) the best available resource data and information, including the views of citizens and special interest groups and all levels of government; and (2) the synthesis and evaluation of such data and information, utilizing professional and administrative judgments on how to best meet statutory goals and objectives and achieve the interests and expectations of the public. Specific to minerals is the mission to integrate the exploration and development of NFS mineral resources with the use and protection of other resource values. Obviously, this directive will involve economic skills, since RPA specifies a program of assessing the value of minerals on NFS lands, and their value in relation to other resources.

The task force set up to implement RPA is the Resource Program and Assessment group (also RPA), based in Washington, D.C. This group is working to establish a common denominator on which to base comparisons of both market and nonmarket values for each of the resource program elements and supporting elements identified in the RPA and NFMA regulations.

The result of this analysis will provide national direction to the regions on output and budget targets covering a period from 1981 to 2030. In addition, the methodologies used by RPA can be followed by the regional and forest level planning staffs to do similar analyses as part of their planning and management programs.

The resource program elements to be studied are recreation, wilderness, wildlife and fish, range, timber, water, minerals, and human and community development. The supporting elements include protection, lands, soils, and facilities. Most of these elements are broken into subunits. As an example, subunits under timber are: new timber sales, reforestation, timber stand improvement, and other timber sales. At the time of this writing, an economic analysis for each subunit resource is being completed, and this analysis is further broken down into each of the National Forest System's (NFS) regions and stations. The economic analysis also looks at several management alternatives. Market goods to which a price can be fixed are analyzed, as well as nonmarket goods, and both inputs and outputs are looked at. For example, in timber, an input would be timber road building. An output would be board feet of sale.

The result of this analysis is to tie together all the resource elements with information on inputs and outputs for a 50-year period. These data will be studied to determine what direction the NFS will take in managing natural resources

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[5]U.S. Laws, Statutes, etc. Public Law 93-378. [S. 2296], Aug. 17, 1974. Forest and Rangeland Renewable Resources Planning Act of 1974. An act to provide for the Forest Service, Department of Agriculture, to protect, develop, and enhance the productivity and other values of certain of the Nation's lands and resources, and for other purposes. In its United States statutes at large. 1974. Vol. 88, pt. 1, p. 476-480. U.S. Gov. Print. Off., Washington, D. C. 1976. [16 U.S.C. 1601.]

under its jurisdiction, taking into account not only economic criteria, but also environmental, social, and physical constraints. In essence, it is a type of national cost/benefit analysis for developing and managing NFS resources for several different management alternatives.

Preliminary results of this analysis show that the net present worth benefit of minerals on NFS land is almost as great as those figures calculated for timber production—and that, for several management alternatives, minerals in some regions have a greater dollar value than timber. (Net present worth benefit is present worth benefit less present worth cost. Figures are in dollars and have been assigned to many market and nonmarket NFS outputs. "Social" values are not figured into this particular study. See table 5.)

RPA has also developed tradeoff comparisons between resources for various management alternatives. (See figures 8-10.) This type of tradeoff analysis sets up a goal (for example, to produce X number of board feet/yr from X area), and then relates what effect this activity will have on other resource activities; what the costs might be; what technology might be used; and what type of management might be employed.

As the graphs show, using one management alternative instead of another reduces the tradeoffs involved when the management of one resource over another is being emphasized. The five management alternatives are:

1. Total development, including high market outputs and high nonmarket activities. Obviously, this alternative would be the most costly to manage.
2. Stewardship, which would mean very little or no development.
3. Moderate market outputs and moderate nonmarket activities.
4. High level of nonmarket activities—for example, an emphasis on wilderness preservation, and a low level of market outputs.
5. Current management program.

A similar type of tradeoff analysis can be done on the forest and regional levels. And, in addition to tradeoffs, the economist can assess what activities complement each other. For instance, building a road to get a mine in is complementary to later having a road to get timber out. The tradeoff is in wilderness value lost.

RPA's studies and recommendations will become operational in 1981. They will establish national policy targets for a timespan from 1981 to 2030. These targets, however, will be reevaluated and adjusted every 5 years. For the economist on the regional or forest level, such direction will provide guidelines and methodologies for his or her own future economic analyses.

Table 5.— *NFS resources, net present worth benefits*[1] *(in billions of dollars at a 4-percent discount rate)*[2]

	Management alternative number				
	1	2	3	4	5
Total NFS	116.2	90.3	95.6	93.6	97.5
Minerals element	46.4	25.9	26.8	26.0	26.5
Timber element	34.3	29.4	34.0	28.0	36.1

[1] Prepared by Resource Program and Assessment, USDA Forest Service, Washington, D.C. Values are in billions of dollars and, for minerals, represent receipts to the U.S. Treasury from such sources as royalties and NFS sales of gravel and sand. For timber, the figure represents both receipts to the U.S. Treasury and the market value of stumpage.

[2] Data base No. 13, Resource Program and Assessment, 1981-2025 time period.

Figures 8-10. The graphs on this and the following pages were developed by the Resource Program and Assessment group, USDA Forest Service. They illustrate that tradeoffs between managing for one resource over another can change dramatically when various management alternatives are used. In particular, when new technology is employed in minerals production, the tradeoff usually is less—a plus for the land manager concerned with balancing resource uses on National Forest System lands.

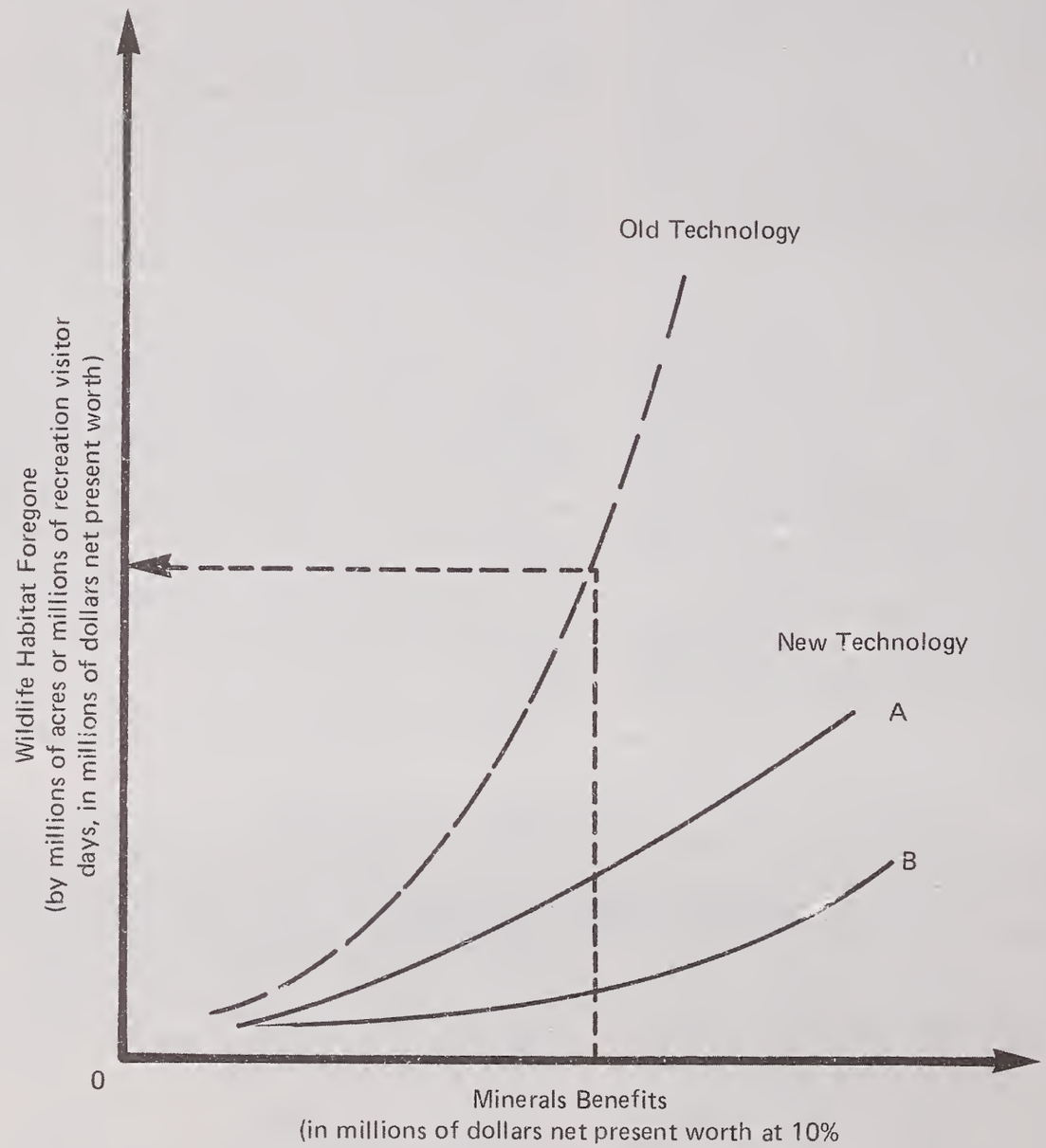

Figure 8. Illustration of tradeoff comparison between minerals and wildlife.
(Data base 11, Resource Program and Assessment)

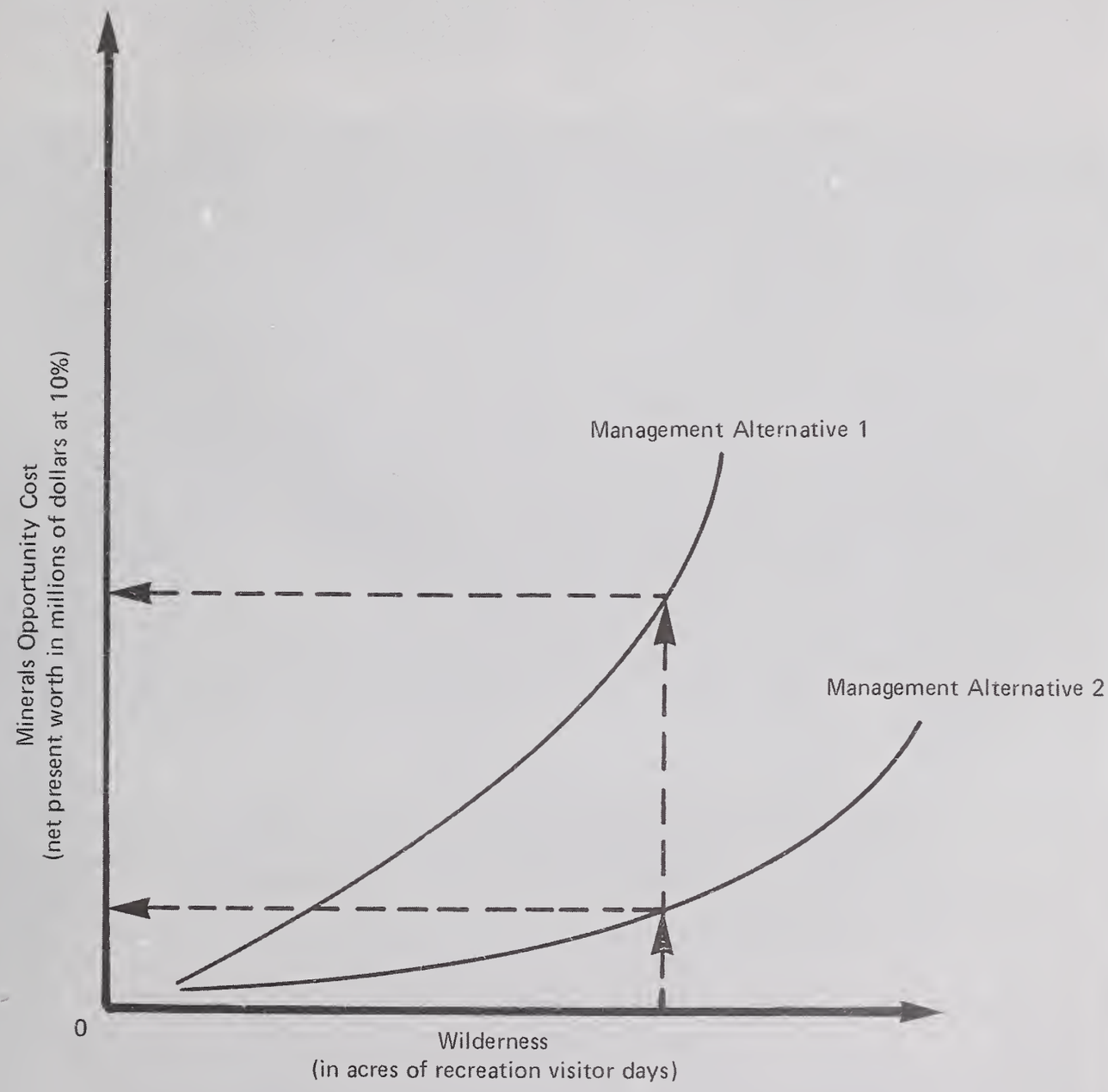

Figure 9. Illustration of tradeoff comparison between minerals and wilderness.
(Data base 11, Resource Program and Assessment)

SUMMARY

As the topics covered in this chapter illustrate, the Forest Service economist's role is tied to a number of variables. He may be asked to look at economic factors on a national level, or he may apply his skills to a site-specific development. The skills and methodologies he employs will be related to his philosophy and education, as well as to the direction given him by the land manager or ID team. How well the economist's skills are used in minerals-development decisions will be largely dependent upon how well the economist can explain his tools to decisionmakers and those responsible for the planning and implementation of plans. But as the economist is able to demonstrate that better decisions can be made because of his input, there is no doubt that he will be drawn more and more heavily into the decisionmaking process involving minerals development on NFS lands.

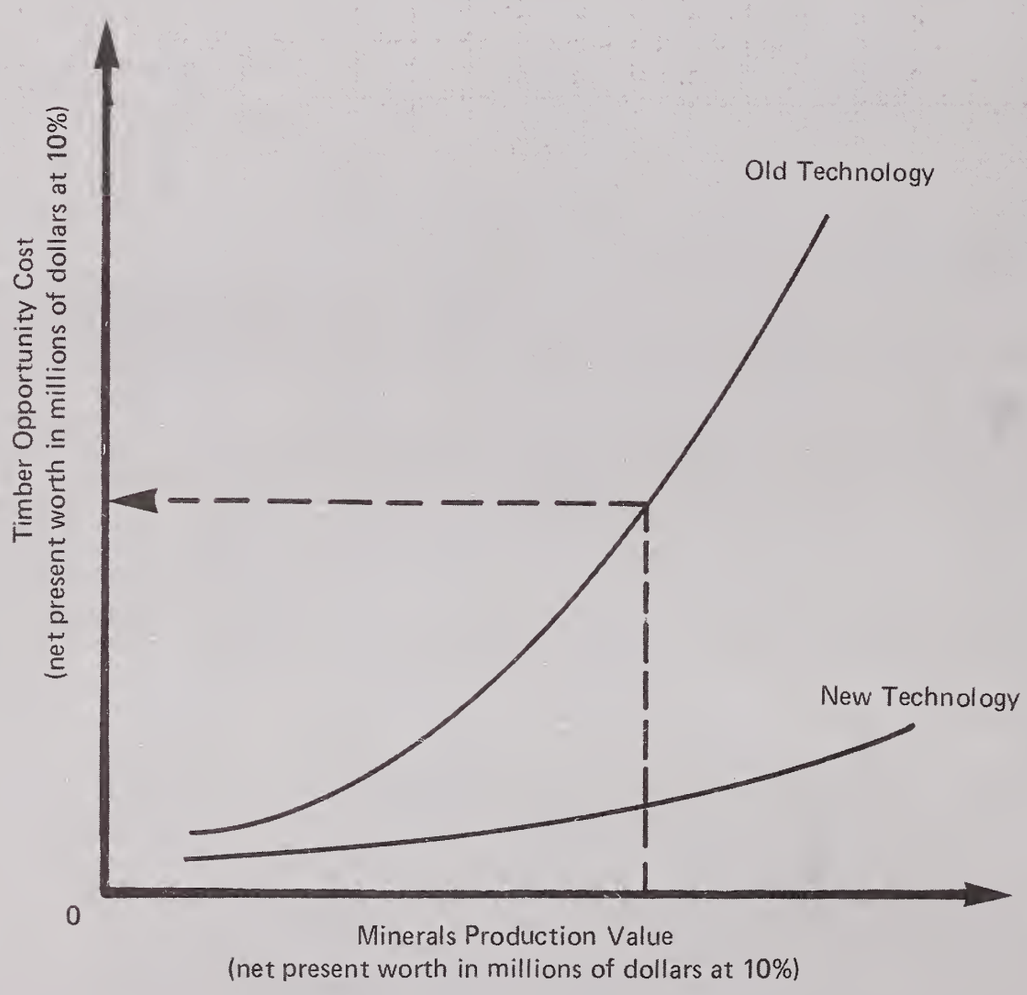

Figure 10. Illustration of minerals opportunity cost comparison to timber.
(Data base 11, Resource Program and Assessment)

Chapter 5
THE ROLE OF THE SOCIOLOGIST

Major Contributors: James Kent, Hanna J. Cortner, Jo Anne Tremaine, Diane Hammond, Julie (Marty) Uhlmann

Nowhere is the importance of public input into the planning and management of Forest Service lands more important than where minerals developments are involved. Such developments, unless quite small, can significantly alter the fabric of the community surrounding the forest, resulting in numerous issues and management concerns. Consider the following scenario:

> A small ranching community lying in a sparsely populated river basin has recently become the hub of an energy boom—the result of increased coal mining activities in the basin. Development has come at a rapid rate without planning, resulting in an uprooting of longtime residents, an increased cost of living, disruption of the wage scale, overcrowded schools and housing, and overloaded recreation facilities and service. The negative impacts have had their effects on local residents and newcomers alike.
>
> No localized recreation has been developed in the vicinity of the town to accommodate this large growth. The old recreational values such as rodeoing, hunting, and fishing that surround ranching life are not satisfactory to the "newcomer" recruited primarily from Eastern coalfields. This lack of local recreation has sent thousands of new miners to a national forest several hundred miles away. The Forest Service was unprepared for the impacts generated by their influx.
>
> The new users of the forest have no knowledge about the physical limitations of the land and their effect on its recreational potential, or about the pride longtime residents have taken in the forest. A four-wheel drive playground has been created which is wreaking havoc with Forest Service management by causing new erosion sources and a general deterioration of esthetic values in the forest.
>
> Local residents have become angered by the "invasion" of their forest, and their traditional partnership with the Forest Service in caring for this public land is showing signs of stress. Residents are beginning to feel they would like to keep the newcomers out.

Obviously, social and economic concerns—the concerns of people—are being expressed by the users of this forest. And, this is only one example of the impacts energy developments have on the forests—whether or not the mines are located within National Forest System boundaries.

In this context, the skills of the sociologist are valuable. By definition, a sociologist is trained to analyze the forms, institutions, and functions of human groups—and how these groups respond to change. Thus, he can help the land manager identify and integrate the public's concerns and demands into land-management decisions, and he can help the land manager understand the effect various land-management practices will have on the public. In other words, similar to staff specialists, such as the hydrologist or soils scientist, who collect and analyze technical information for the land manager, the sociologist can apply sociological methodologies to the analysis and prediction of human behavior, and translate the results into a form that will be useful to the land manager in his decisionmaking processes.

The sociologist can also play a role internally within the Forest Service. Again, because of his training, he may be called on to help other members of the forest staff become more attuned to the messages the public is sending, and, within the organization itself, to understand the

principles of human interactions and group dynamics.

Of course, the functions a sociologist performs depend on his training, and will also vary from forest to forest and between levels in the Forest Service. For example, on a local level, the land manager may see the sociologist's role as "diplomat"—a person who can communicate well with the local community. At other times, the land manager may need the sociologist's analytical skills, which might include formation of a model of a component of society or devising survey instruments.

Thus, as is the case with other members of the Forest Service team, the sociologist's role will be directed by management. He may have skills in crisis intervention or community organization, and he will use these skills at the request of the land manager. It is, however, also important to note that whereas other specialists, for example, the soils scientist, have a long tradition with the Forest Service, the sociologist is a relative newcomer. Because of this, his role in the organization is still developing, and the sociologist may have to educate management about the skills he can contribute to the team.

This chapter will highlight the various kinds of roles the sociologist can play on the forest level, especially as these activities relate to minerals developments and the effects these developments have on communities. For purposes of discussion, these roles have been broken down into six categories: describe, analyze, predict, translate, implement, and monitor.

DESCRIBE

The social, political, and cultural description of society is the baseline from which analysis, predictions, and management actions will develop. The sociologist, however, must place some boundaries on the amount and type of data he will gather to describe the society under study. These boundaries take the form of models and methodologies.

Sociological models are ways of looking at and analyzing human groups. (See chapter 3 for examples of these models.) Methodologies are specific techniques that can be employed by the sociologist. These can include ethnographies, survey research techniques, and demographic studies—looking at statistics, such as death rates and migration patterns.

The sociologist may develop his own models and methodologies, or he may adopt those developed by others in his field. But the purpose is the same: to systematically describe the structural parts of society and its systems. This description will then provide the sociologist with the basic information he needs to proceed to analysis.

ANALYZE

Once the baseline data are collected, the sociologist can fit the data into the model he has chosen and begin to make interpretations of the data. For example, if population figures show that the community is rapidly expanding, and if forest visitor-use figures show a corresponding increase, he can interpret these figures to mean that the increase in forest use is due mainly to the increase in resident population near the forest, and not to an influx of tourists.

The sociologist's skills in analysis are especially valuable when change is occurring. Because he has some understanding of the fabric of the community through his studies and discussions with residents, he can relate this knowledge to other indicators of the community's acceptance or rejection of the change. He can identify which segments in the society are most affected by the change, and which are least affected. And, as issues surface, the sociologist can help determine the source of the issue, whether the issue is of local, regional, or national concern, and whether the Forest Service can resolve the issue. In other words, because of his skills in zeroing in on what members of the community say, think, and value, the sociologist will often be the primary identifier of public issues.

Another analytic role involves evaluation of management alternatives. At the request of the line officer, the sociologist might analyze these alternatives to determine the one that will best maximize social benefits, minimize social disruption, and be politically feasible. Cost/benefit studies are part of this analysis.

PREDICT

Analysis is closely tied into prediction. Based on what the sociologist interprets from data on the current situation, he may be able to go one step further and predict the future social consequences of certain actions and predict future issues. In the case of a minerals development, he may be able to predict the social consequences of the development—jobs affected, recreation patterns altered, and value systems impacted. He can often predict who will be the future "winners" and "losers" in a development, and why this is so.

The sociologist, through his analysis, can also pinpoint certain trigger points, or causal mechanisms, that will induce changes. By watching for these trigger points, he can help the ID team anticipate the shockwave of emerging issues. Of course, this is not to say that other Forest Service personnel will not take part in predicting issues. But the sociologist, because of his education, training, and experience, can usually become more quickly attuned to this type of activity.

A more formal approach to predicting the social consequences of change is taken in a social impact assessment. The Forest Service sociologist may find it necessary to prepare a social impact assessment for the forest, for example, as part of the forest plan. Or, he may be responsible for reviewing the social impact assessment prepared by a mining company as part of its Environmental Assessment or Environmental Impact Statement. A social impact assessment can be defined as: an analysis of externally induced changes affecting social and economic systems and the people and institutions making up those systems. (See chapter 3 for more information on social impact assessments.)

Of course, evaluation of change is difficult because change is qualitative; because the evaluation depends on people's perceptions at any given point in time; and because these perceptions will change, as will the events to which they are responding. In addition, it is difficult to collect reliable data to make such qualitative types of assessments. The sociologist, however, can help the land manager evaluate available data—an important aid for the manager's planning and management strategies.

TRANSLATE

One of the most important roles of the sociologist is to translate his descriptions, analyses, and predictions into a form that will be useful to the land manager. Similarly, at the direction of the land manager, he may be asked to translate Forest Service policy into the language of the community.

Another aspect of the translator role is to make sociological skills usable by the nonsociologist. In other words, the sociologist should be able to explain methodologies, models, and other sociological tools well enough so that the land manager and members of the ID team can participate in social analysis. This is especially crucial if the forest does not have a full-time sociologist assigned to it. In these cases, a sociologist from the regional level may be asked to help set up a public involvement process for the land manager, and when he leaves, the process should be operable by the staff on duty in the forest.

IMPLEMENT

At the discretion of the line officer, the sociologist may also be asked to use his skills in the area of implementation—translating management plans into actions. For example, he may be asked to go into the community, and, based on his analysis of its character, work with it to resolve an issue. He may be asked to implement human interaction programs, plans, and management strategies for dealing with the community. And he may be asked to apply his knowledge in crisis intervention.

The following list gives some examples of the sociologist's role in implementation:

- Establish communication networks between the Forest Service and its publics, and, in particular, strengthen informal communication networks.
- Separate long-term planning issues from short-term operational issues, help carry out the plans for resolving these issues, and keep the public informed of these activities.
- Develop and implement conflict strategies and methods of crisis intervention.
- Aid in the on-going *process* of planning by

applying skills of decisionmaking processes.

- Help the land manager become more attuned to the political groups in the community and the political aspects of resource decisions.

MONITOR

The processes of social description, analysis, prediction, and implementation are ongoing. Thus, the sociologist must constantly monitor the community for changes that may, in turn, require revisions in management practices and plans.

APPENDIX A

GLOSSARY

Baseline data: In reference to sociology and economics, baseline data are the social, political, economic, and cultural descriptions of a society from which analysis, predictions, and management actions will develop.

Communication network: A group of individuals who form a system for maintaining or activating their interests—including both formal and informal groups.

Cost/benefit analysis (also benefit/cost analysis): An analytical approach to solving problems of choice, which identifies for each objective that alternative yielding the greatest benefit for a given cost or that alternative producing the required level of benefits at the lowest cost. This same analytical process has also been referred to as cost effectiveness analysis when the benefits of the alternatives cannot be quantified in terms of dollars.

Decision criteria: Goals and objectives that will resolve the issues, management concerns, and program requirements identified by the planning team. These criteria also provide guidance for evaluation and selection of alternatives during the planning process.

Discounting: The practice of placing a lesser value (economic or other) on future events than on present events for the purpose of comparison. An item received today is seen to be worth more than an identical item received next year.

Discount rate: The interest rate used in plan formulation and evaluation for discounting future benefits and computing costs, or otherwise converting benefits and costs to a common time basis.

Economic impact assessment: An assessment of the economic impacts of change on a community; it consists of budget and fiscal impacts, economic activity impacts, and economic and social structural changes.

Environmental Assessment (EA) (Replaced the EAR): An analysis of all actions and their predictable short- and long-term environmental effects, which include physical, biological, economic, and social factors and their interactions. Also, a concise public document required by the regulations for implementing the procedural requirements of the National Environmental Policy Act of 1969 (NEPA).

Environmental Impact Statement (EIS): A document prepared by a Federal agency in which anticipated environmental effects of a planned course of action or development are evaluated, as prescribed by the National Environmental Policy Act of 1969 (NEPA).

Existing public: A specific part of a population that can be grouped together because of some common interest or purpose.

Feasibility study: As applied to mining, the feasibility study follows discovery of the mineral and is done by the mining company. Its purpose is to analyze the rate of monetary return that can be expected from the mine at a certain rate of production. Based on this study, the decision to develop the ore body may be made.

Forest plan: See land-management plan.

Goal: A concise statement of an organization's central strategy in addressing a problem expressed in terms of a desired state or process that operating programs are designed to achieve. A goal is usually expressed as a broad general statement, is generally not quantifiable, and is timeless in that it usually has no specific date by which it is to be completed. A goal is the principal statement by which objectives must be developed.

Human Resource Unit (HRU): A geographic area tied together by a common physical, social, and economic environment; the HRU is specific to the forest or district level. It can be used as a planning and implementation tool for forecasting and managing the social impacts resulting

from changes in resource use on the forest or district level.

Impact: The force of impression or operation of one thing on another.

Inputs: The basic resources of land, labor, and capital required in carrying out an activity.

Interdisciplinary team (ID team): As proposed by recent Forest Service regulations, the interdisciplinary team will be comprised of Forest Service personnel who collectively represent two or more areas of specialized technical knowledge about natural resources management applicable to the area being planned. The team will consider problems collectively, rather than separate concerns along disciplinary lines. This interaction will insure systematic, integrated consideration of physical, biological, social and economic, and other sciences.

Land-management plan: According to Forest Service regulations, each forest must have a forest plan, which outlines the most desired and alternative land uses for that site.

Management concern: An issue or problem requiring resolution, or condition constraining management practices, identified by the interdisciplinary team.

Marginal decisionmaking: Making a decision by comparing tradeoffs resulting from small changes in actions instead of comparing total or average outputs.

Mining plan: Submitted by the mining operator, the mining plan outlines the steps the mining company will take to mine and reclaim the site. The mining plan is submitted prior to start-up of mining operations.

Objective: A clear and specific statement of planned results to be achieved within a stated time period. The results indicated in the statement of objectives are those which are designed to achieve the desired state or process represented by the goal. An objective is measurable and implies precise time-phased steps to be taken and resources to be used which, together, represent the basis for defining and controlling the work to be done.

Opportunity cost: The value of the benefits foregone or given up due to the effect of choosing another management alternative that either impacts existing outputs or shifts resources away from other activities so that they are no longer produced and their benefits are lost.

Optimization analysis: Analysis to determine which alternative program will maximize or minimize a set of decision criteria, given certain constraints.

Outputs: A broad term for describing any results, products, or services that a process or activity actually produces.

Public issue: A subject or question of widespread public interest relating to management of National Forest System lands and identified through public participation.

Reclamation: Returning disturbed lands to a form and productivity that will be ecologically balanced and in conformity with a predetermined land-management plan.

Rehabilitation: See Reclamation.

Social impact assessment: An analysis of externally induced changes affecting social and economic systems, and the people and institutions making up those systems.

Social Resource Unit: Similar to the Human Resource Unit, except that it covers a wider area, and thus can be linked to regional planning.

Sociological models: Models for systematically describing and analyzing human groups and their systems.

Subsistence base: Economic variables that influence a group; these variables include employment base, level and distribution of income, characteristics of production, and ownership of resources.

Supply/demand analysis: The relationship of

amounts of goods available for sale at various prices to the amounts of goods that will be bought at various prices.

Tradeoff analysis: An analysis of the combination of benefits and costs which are gained and lost in switching between alternative courses of action. Tradeoffs include only those portions of benefits and costs which are not common to all alternative courses of action under consideration.

APPENDIX B

PRESENTERS AND PARTICIPANTS

Edwin R. Browning
USDA Forest Service
Federal Bldg.
324 25th St.
Ogden, UT 84401

Hanna J. Cortner, Research Associate
School of Renewable Natural Resources
University of Arizona
Tucson, AZ 85721

Larry Dale, Economist
Pacific Southwest Forest and Range
Experiment Station
P. O. Box 245
Berkeley, CA 94701

Grant Davis
SEAM
145 Grand Ave.
Billings, MT 59101

Dick Dyrland
Resources Program and Assessment
USDA Forest Service
P. O. Box 2417
Washington, DC 20013

Gary H. Elsner, Project Leader
Pacific Southwest Forest and Range
Experiment Station
P. O. Box 245
Berkeley, CA 94701

Gerald E. Gould, Regional Mining Engineer
Lands and Minerals
USDA Forest Service
517 Gold Ave. SW.
Albuquerque, NM 87102

Richard Greiwe
Foundation for Urban and Neighborhood
Development
2653 West 32nd Ave.
Denver, CO 80211

James Hagemeier, Deputy Forest
Supervisor
Ottawa National Forest
US 2 East
Ironwood, MI 49938

Diane Hammond, Research Economist
Denver Research Institute
2390 South University Blvd.
P. O. Box 10127
Denver, CO 80210

Allan L. Hinds, District Ranger
Sierra Vista Ranger District
1231 East Fry St.
Sierra Vista, AZ 85635

Neal Jensen
Uinta National Forest
88 West 100 North
Provo, UT 84601

James Kent
Foundation for Urban and Neighborhood
Development
2653 West 32nd Ave.
Denver, CO 80211

Steve R. Plevel
Planning and Information Staff
Coronado National Forest
301 West Congress St.
Tucson, AZ 85701

Terry Randolph, Land Use Planner
Toiyabe National Forest
111 North Virginia St.
Reno, NV 89501

Terry G. Solberg, Group Leader
Minerals Impact Evaluation
11385 Allomont Dr.
Lolo, MT 59847

Warren Thiem, Economist
USDA Forest Service
Federal Bldg.
324 25th St.
Ogden, UT 84401

Ed Thor, Economist
Pacific Southwest Forest and Range
Experiment Station
P. O. Box 245
Berkeley, CA 94701

Jo Anne Tremaine, Sociologist
Arapaho/Roosevelt National Forest
301 South Howes St.
Ft. Collins, CO 80521

Julie (Marty) Uhlmann, Research Anthropologist
Denver Research Institute
2390 South University Blvd.
P. O. Box 10127
Denver, CO 80210

Fred Wagstaff
Shrub Sciences Laboratory
735 North 500 East
Provo, UT 84601

Lambert N. Wenner, Social Scientist
Minerals and Geology
USDA Forest Service
P. O. Box 7669
Missoula, MT 59807

Ken Weyers, Forest Supervisor
Lewis and Clark National Forest
Box 871
Great Falls, MT 59403

APPENDIX C
INDEX

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980-0-677-121/86

USDA Forest Service.
1979. User guide to sociology and economics. USDA For. Serv. Gen. Tech. Rep. INT-73, 53p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

Summarizes and discusses the roles of the sociologist and economist when working with the social and economic concerns that arise from minerals developments on or near Forest Service lands. Topics include land-management planning, issue identification and resolution, sociologic and economic tools for land managers, and role statements for the economist and sociologist in the context of minerals developments.

KEYWORDS: Sociology, economics, mining, land-management planning process, public issues

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THE SEAM PROGRAM

The Surface Environment and Mining Program, known as SEAM, was established by the Forest Service to research, develop, and apply new technology to help maintain a quality environment while helping meet the Nation's mineral requirements. SEAM is a partnership of researchers, land managers, mining industries, universities, and political jurisdictions at all levels.

Although the SEAM Program was assigned to the Intermountain Station, some of its research projects were administered by the Rocky Mountain and Pacific Southwest Research Stations.

MINERAL USER GUIDES

Other User Guides for specialists involved in minerals activities are:

- User Guide to Vegetation, Gen. Tech. Rep., INT-64
- User Guide to Soils, Gen. Tech. Rep., INT-68
- User Guide to Engineering, Gen. Tech. Rep., INT-70
- User Guide to Hydrology, Gen. Tech. Rep., INT-74
- User Guide for Wildlife (planned)
- User Guide for Visual Management (to be published as part of the National Forest Landscape Management Series)

To obtain copies of these guides, write: Intermountain Forest and Range Experiment Station, USDA Forest Service, 507 25th St., Ogden, UT 84401.